Chapter # 1

Fundamentals of Chemistry

Q 1. Define chemistry. Explain any two branches of chemistry.

The branch of science which deals with the composition, structure, properties and reactions of matter is called chemistry.

Branches of chemistry:

i. **Organic Chemistry** is the study of covalent compounds of carbon and hydrogen (hydrocarbons) and their derivatives.

ii. **Inorganic chemistry** is the study of all elements and their compounds except those compounds of carbon and Hydrogen (hydrocarbons) and their derivatives.

Q 2. Differentiate between organic and inorganic chemistry OR Define Organic chemistry. (OR) Define inorganic chemistry.

Organic Chemistry	Inorganic chemistry
It is the study of properties and behavior of hydrocarbons (compounds of carbon and hydrogen) and their derivatives.	It is the study of properties and behavior of all elements except the hydrocarbon and their derivatives
Scope: Petroleum, petrochemicals and pharmaceutical industries.	**Scope:** Glass, cement, ceramics and metallurgical industries.

Q 3. Define physical chemistry and nuclear chemistry?

Physical chemistry: *The branch of chemistry that deals with the relationship between composition and physical properties of matter along with changes in them.*

Nuclear chemistry: *Nuclear chemistry is the branch of chemistry that deals with the radioactivity, nuclear processes and properties.*

Q 4. Differentiate between biochemistry and industrial chemistry?

Biochemistry	Industrial chemistry
The branch of chemistry in which we study the structure, composition and chemical reactions of substances found in living organisms	*The branch of chemistry that deals with the manufacturing of chemical compounds on commercial scale is called industrial chemistry*
It deals with the **life maintaining compounds** like carbohydrates, proteins and lipids etc.	It deals with the manufacturing of **basic chemicals** like sulphuric acid, nitric acid and ammonia etc.

Q 5. Differentiate physical chemistry and biochemistry? OR Define Biochemistry?

Physical Chemistry	Biochemistry
The branch of chemistry that deals with the relationship between the composition and	The branch of chemistry in which we study the structure, composition and chemical reactions of substances found in living organism.

physical properties of matter along with changes in them.	
It studies Structure of atom, bond formation and behavior of gases etc.	It studies Metabolism, food science and medicine etc.

Q 6. Give scope of biochemistry? (OR) Give two applications of Biochemistry

Biochemistry covers all major fields in modern biological sciences:

- It is applied in the fields of medicine, food-science and agriculture etc.
- It deals with the basic life maintaining compounds like carbohydrates, proteins and lipids etc.

Q 7. Define Environmental chemistry.

It is the branch of chemistry in which we study components of environment and effects of human activities on the environment.

It is related to environment and applies in ecology, soil, water geology etc.

Q 8. Define Industrial Chemistry and Analytical chemistry?

Industrial Chemistry: *The branch of chemistry that deals with the manufacturing of chemical compounds on commercial scale is called industrial chemistry*

Analytical chemistry: *The branch of chemistry that deals with separation and analysis of sample to identify its components.*

Q 9. Define matter and mixture.

Matter	Mixture
Matter is simply defined as anything that has mass and occupies space. **Example:** Air water etc.	When two or more elements or compounds mix-up physically without any fixed ratio, they form a *mixture* **Example:** Soil Air wood etc.

Q 10. Differentiate between physical and chemical properties. OR Which are physical properties of matter? OR Which are chemical properties of matter?

Physical properties	Chemical Properties
The properties which are associated with the physical state of the substance are called Physical properties.	Chemical properties depend upon the composition of the substance
Most of the physical properties depend upon atomic mass	Chemical properties only depend upon atomic number of a substance.
Examples: Color, taste, melting and boiling points etc.	**Examples:** basicity, Corrosion and inertness etc.

Q 11. How homogeneous mixture does differ from heterogeneous mixture? OR Define Homogeneous mixture and give example? OR Define Heterogeneous mixture and give example?

Homogeneous Mixtures:	Heterogeneous mixtures:
Mixtures that have uniform composition throughout are called homogeneous mixtures.	Those mixtures in which composition is not uniform throughout are called heterogeneous mixtures.
Density of Homogeneous mixture is usually uniform throughout the mixture.	Density of Heterogeneous is not same throughout mixture.

For example Air, Gasoline and ice cream	**For Example:** Soil, Rock and Wood etc.

Q 12. Define element and compound? (OR) What is meant by elements? Give examples?

Element: A substance made up of same type of atoms, having same atomic number and which cannot be decomposed into simple substances by ordinary chemical means is called element.
Examples: Oxygen, Silicon and Nitrogen etc.
Compounds: It is formed by chemical combination of atoms of element. The constituent elements lose their identity and form a new substance having entirely different properties.
Example: Water, sugar and ammonia etc.

Q 13. Write names of following elements: Na, Ba, Hg, W

Name of the elements are as follows
Na= Sodium Ba=Barium Hg= Mercury W= Tungsten

Q 14. Which gasses are present in Air? Write their names?

There are following gasses present in atmosphere Nitrogen, oxygen, Argon, carbon dioxide and other noble gasses.

Write the percentage by weight of oxygen in atmosphere and oceans.

Percentage by weight of oxygen is as follows:

Oxygen in oceans: 86% Oxygen in atmosphere: 21%

Q 15. Write chemical formulae of caustic soda and Washing soda?

Formulae for caustic soda and washing soda are as follows:

Common Name	Chemical formula
Caustic soda	NaOH
Washing soda	Na_2CO_3

Q 16. Write formulae of Common salt and Sugar?

Sodium Chloride(common salt) **NaCl**
Sugar $C_{12}H_{22}O_{11}$

Q 17. Explain why hydrogen and oxygen are considered elements whereas water as a compound.

Hydrogen and oxygen are elements because:

- They are not formed by mixing or reaction of other elements.
- They have same type of atoms, having same atomic number.
- They cannot be decomposed into other simpler substances by chemical means.

Water is considered as a compound because:

- It is a substance made up of two elements chemically combined together in a fixed ratio (1:8 by mass of oxygen and hydrogen) to form a chemical bond.
- It consists of different type of atoms (hydrogen and oxygen), having different atomic mass and different identities.
- It can be separated into its individual constituents by chemical means.

Q 18. Differentiate between compound and mixture?

Compound	Mixture
It is formed by a chemical combination of atoms of the elements in fixed ratio.	Mixture is formed by the simple mixing up of the substance without fixed ratio.

Every compound is represented by a chemical formula and it has unique properties.	Mixtures don't have their chemical formula.

Q 19. State three reasons why do you think air is a mixture and water a compound?

AIR (mixture):

a. Air is a mixture, formed by the simple mixing of the substances with non-uniform ratio.
b. Components of Air can be separated by physical means (crystallization, magnetization and evaporation etc.).
c. Air consists of number of gasses like (N_2, O_2, CO_2 and Nobel gasses) and does not have chemical formula and it shows properties of these constituents.

Water (compound):

a. Water is formed by the chemical combination of atoms of elements in fixed ratio (1:8 of hydrogen and oxygen by mass in H_2O)
b. Components of Water cannot be separated by physical means (evaporation, filtration and crystallization etc.)
c. Water has chemical formula H_2O and has unique properties.

Q 20. Define symbol and valency? Give example

Symbol of an element is its unique designation employed in chemical formula and in its other descriptions.
Example: Symbol of Sodium is **Na** while of hydrogen is **H**
Valency is the combining capacity of an atom.
Example: valency on Cl^- is "1-"

Q 21. What is valency of following: Sulphur(S), sodium (Na), Nitrogen(N), Barium(Ba)

The valency of the elements is:
Sulphur S shows valency of "2-"
Sodium Na shows valency of "1+"
Nitrogen (N) shows valency of "3-"
Barium Ba shows valency of "2+"

Q 22. Define atomic number and atomic mass (OR) Differentiate between atomic number and mass number of an atom.

Atomic number	Atomic mass
The atomic number of an element is equal to the number of protons present in the nucleus of its atoms	Atomic mass is the sum of number of protons and neutrons present in the nucleus of an atom
It is represented as **Z**	It is represented as **A** (Where **A=Z+n)**
For example: Atomic number of Hydrogen is 1 and for oxygen is 8	**Example:** Atomic mass of Hydrogen 1 and for Oxygen is 16

Q 23. How many protons and neutrons are there in an atom having A= 238 and z=92?

Atomic mass A=238
Atomic number Z=92
Required:
number of protons=?
number of neutrons=?
Solution:

Since atomic number represents proton number so
number of protons=Atomic number Z =92
number of neutrons=n=A-Z

n=238-92=146

Q 24. What is relative atomic mass? How it is related to grams?

The relative atomic mass of an element is the average mass of atom of that element as compared to 1/12th of mass of one atom of carbon-12.
Unit atomic mass unit (amu).
amu: It is the unit of relative atomic mass. One atomic mass unit (amu) is equal to the mass of 1/12th of one atom of C-12.
$1amu=1.66x10^{-24}$ g

Q 25. Define atomic mass unit. Why is it needed?

Definition:
It is the unit of relative atomic mass where one atomic mass unit is equal to 1/12th the mass of one atom of C-12.
It is represented by **amu**
1 amu = 1.66×10^{-24}g
Significance: It provides us standard C-12 scale to determine the mass of various elements accurately. This is the best known standard to determine mass of atoms of elements.

Q 26. Write two significances of chemical formula?

1. It shows the elements present in the molecule.
2. It shows the composition of molecules.

Q 27. Differentiate between molecular formula and empirical formula? (OR) Define Empirical formula with example. (OR) Define molecular formula with examples?

Molecular formula	Empirical formula
Molecular formula shows actual number of atoms of each element present in a molecule of that compound	It is the simplest whole number ratio of atoms present in a compound
For example: Molecular formula of Glucose is $C_6H_{12}O_6$	For example: empirical formula of glucose is CH_2O

Q 28. Relation between molecular formula and empirical formula?

Relationship between molecular formula and empirical formula is:
Mathematically: Molecular formula= $(\text{Empirical Formula})_n$
Where n=1,2,3...

Q 29. Differentiate between molecular mass and formula mass? (OR) Define formula mass with example?(OR) Define molecular mass with example?

Molecular mass	Formula mass
The sum of atomic masses of all the atoms present in one molecule of a molecular substance is its molecular mass	The sum of masses of all the atoms present in one formula unit of a substance is its formula mass
For example molecular mass of H_2O is 18amu and of CO_2 is 44amu	**For example** formula mass of NaCl is 58.5amu and of $CaCO_3$ is 100amu

Q 30. Calculate molecular mass of Nitric acid (HNO_3)?

Solution:

Atomic mass of H=1amu
Atomic mass of N=14amu
Atomic mass of O=16 amu
Formula unit= HNO_3
Formula mass= 1(1)+1(14)+3(16)

Formula mass=63 amu

Q 31. Calculate the formula mass of potassium sulphate K_2SO_4

Solution:
Atomic mass of K=39amu
Atomic mass of S=32amu
Atomic mass of O=16 amu
Formula unit= K_2SO_4
Formula mass= 2(39)+1(32)+4(16)

Formula mass=174 amu

Q 32. Calculate the number of moles in 28.4g of sodium sulphate (Na_2SO_4)

Given mass of Na_2SO_4 =28.4g
Molecular mass of Na_2SO_4 =142g

Number of moles = $\frac{\text{given mass}}{\text{molar mass}}$

$=\frac{28.4}{142}$

Number of moles=0.2mol

Q 33. Calculate the gram molecule (number of moles) in 40g of H_3PO_4?

Given mass of H_3PO_4 = 40 gram
Molecular mass = 98gmol^{-1}

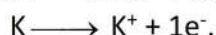
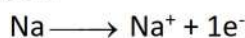
Number of moles = $\frac{\text{given mass}}{\text{molar mass}}$

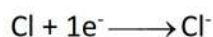
Number of gram molecules= 40/98=0.408.

Q 34. Define cation and Anion and give one example of each?

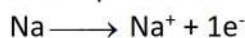
a. What is meant by cation? (OR) Define anion. Give one example?

Cation: An atom or group of atoms having positive charge on it is called **Cation. Cations are formed** when atoms lose electrons from their outermost shell.

$$Na \longrightarrow Na^+ + 1e^-$$
$$K \longrightarrow K^+ + 1e^-.$$

Anion: An atom or group of atoms that has a negative charge on it is called Anoin.
Anions are formed by Addition of electrons in outermost shell.

$$Cl + 1e^- \longrightarrow Cl^-$$
$$O + 2e^- \longrightarrow O^{-2}$$

Q 35. How cations are formed?

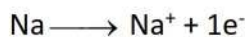
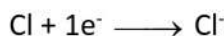
Cations are formed, when an atom loses electrons from its valence shell.
For example: Na^+ and K^+ are cations of sodium and potassium and are formed by losing electron as follows:

$$Na \longrightarrow Na^+ + 1e^-$$
$$K \longrightarrow K^+ + 1e^-$$

Q 36. What will be the nature of charge on an atom when it loses an electron or when it gains an electron?

An atom attains positive charge when it loses an electron and it attains negative charge when it gains an electron.
For cations:

$$Na \longrightarrow Na^+ + 1e^-$$
$$K \longrightarrow K^+ + 1e^-.$$

And for anions:

$$Cl + 1e^- \longrightarrow Cl^-$$
$$O + 2e^- \longrightarrow O^{-2}$$

Q 37. Differentiate between ion and atom?

Ion	Atom
Ion is an atom or group of atoms having a charge on it.	It is a smallest unit of an element.
It cannot exist independently and surrounded by oppositely charged ions.	It can or cannot exist independently and can take part in a chemical reaction.
It has a net charge (either negative or positive).	It is electrically neutral.
Example CH_4^+, N_2^+, Cl^- and OH^-	Example: He, Ne, H and Na etc.

Q 38. What is meant by molecular ion? Give examples OR How molecule and molecular ions are different from each other?

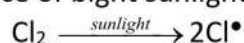
Molecule	Molecular ions
The smallest particle of an element or compound which can exist independently and shows all the properties of that compound.	It is formed by gain and loss of electrons by a molecule.
It is always neutral and stable.	It can have negative or positive charge and it is reactive.
It is formed by combination of atoms.	It is formed by the ionization of molecules.
Examples: O_2, H_2O, CO_2 and NH_3 etc.	Example: CH_4^+, N_2^+, He^+

Q 39. Define free radical? Give examples?

Free radicals are atoms or group of atoms possessing odd number of (unpaired) electrons.
These are represented by putting dot over the symbol of an atom.
These are extremely reactive species
Example: $H^\bullet$, $Cl^\bullet$, $H_3C^\bullet$

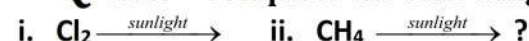
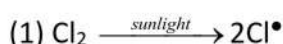
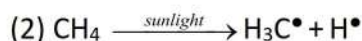
Q 40. How free radical is formed?

Free radicals are generated by homolytic (equal) breakage of bond between two atoms when they absorb heat or light energy.
Example:
Chlorine gas produce free radicals in presence of bight sunlight:

$$Cl_2 \xrightarrow{sunlight} 2Cl^\bullet$$

Q 41. Complete the following equations:

i. $Cl_2 \xrightarrow{sunlight}$ **ii.** $CH_4 \xrightarrow{sunlight}$ **?**
Ans:

$$(1)\ Cl_2 \xrightarrow{sunlight} 2Cl^\bullet$$

$$(2)\ CH_4 \xrightarrow{sunlight} H_3C^{\bullet} + H^{\bullet}$$

Q 42. Define triatomic and polyatomic molecule?

Triatomic molecule: The molecule which consists of three atoms is called triatomic molecule.
For example: H_2O, CO_2 and O_3 etc.
Polyatomic molecule: The molecule consists of many atoms is called polyatomic molecule.
For example: H_2SO_4, $C_6H_{12}O_6$ and CH_4 etc.

Q 43. Differentiate between homoatomic and heteroatomic molecules with examples.

a. Define homoatomic molecule with example. AND Define hetroatomic molecule. Give examples.

Homoatomic molecule	Heteroatomic molecules
A Molecule containing same type of atoms is called **homoatomic molecule**.	When a molecule consists of different kinds of atoms, it is called **heteroatomic** molecule
A pure substance with homoatomic molecules is called **Element.**	A pure substance with hetroatomic molecules is called **compound**
For example: hydrogen (H_2), ozone (O_3) and sulphur (S_8) etc.	For example: Carbon dioxide CO_2, Water H_2O and sulphuric acid H_2SO_4 etc.

Q 44. Define gram atom and gram molecule?

Gram atom: The atomic mass of an element represented in grams, is known as gram atom.
Gram molecule: When the molecular mass of compound is shown in grams, it is known as gram molecule.

Q 45. Define Avogadro's number?

The number of atoms, ions or molecules present in one mole of a substance is constant and is equal to 6.02×10^{23}. It is called Avogadro's number.

- It is represented by $\mathbf{N_A}$

Avogadro's number= $\frac{\text{Number of particles}}{\text{Number of moles}}$

Q 46. What is mole?

Definition:
"Mole is defined as the amount (mass) of substance that contains 6.02×10^{23} number of particles (atom, molecules or formula units)."
No. of moles=known mass of substance/Molar mass of substance

12g of Carbon = 1 mole of carbon
18g of water = 1 mole of H_2O
58.5g of NaCl = 1 mole of NaCl

Q 47. Calculate number of moles in 9g of carbon

Solution:
The known mass of water =9g
Molar mass of water =18g
Number of moles $= \frac{mass\ of\ subsance}{molar\ mass\ 0f\ substance}$
=9/18
=0.5mol

Q 48. How many molecules of water present in half mole of water?

Number of moles of water =0.5mol
Number of molecules =number of moles x Avogadro's number
$= 0.5 \times 6.02 \times 10^{23}$

$=3.01 \times 10^{23}$

Q 49. How many atoms of hydrogen present in one mole of water?

Number of moles of water =1mol
Number of molecules =number of moles x Avogadro's number
$=1 \times 6.02 \times 10^{23}$
$=6.02 \times 10^{23}$

As we know 1 molecule of water contains 2 atoms of hydrogen. So,
Number of Hydrogen atoms $=2 \times 6.02 \times 10^{23}$
$=12.04 \times 10^{23}$

Chapter #2

Structure of Atoms

Q 1. What are the main postulates of Dalton's atomic theory?

- Atom is hard, dense spherical and indivisible particle.
- An element has same type of atoms.
- An atom combines in different ways to form a compound.

Q 2. What is plum pudding theory and who presented it?

Plum pudding theory:
In 1897, J.J Thomson explained the structure of atoms by Plum pudding model.
According to this theory:
The atoms are solid structures of positive charge with tiny negatively charged particles stuck inside. It is like plums in the pudding.

Q 3. Who discovered the proton and neutron? OR Who discovered proton and when?

Proton was discovered by **Goldstein** in 1886.
Neutron was discovered by **Chadwick** in 1932.

Q 4. What is the nature of charge on cathode rays?

- Cathode rays are negatively charged.
- The charge on cathode rays (electrons) was found to be 1.6×10^{-19}C.

Q 5. Give five characteristics of cathode rays.

1. Cathode rays travel in straight line perpendicular to cathode surface.
2. They can cast a sharp shadow of non-transparent object placed in their path.
3. They raise temperature of the body on which they fall.
4. These are negatively charged rays.
5. Light is produced when they hit the sides of discharged tube

Q 6. How positive rays are generated?

When cathode rays colloids with remaining gas molecules in discharge tube, the gas molecules are converted into positive ions.

$$M + e^- \longrightarrow M^+ + 2e^-$$

Q 7. Why positive rays are called canal rays?

Goldstein observed the rays other than cathode rays in discharge tube. He observed that these rays move opposite to cathode rays. He used perforated cathode in discharge tube. These rays passed through this perforated cathode and produce light on tube wall. He called them "canal rays".

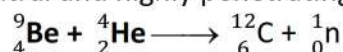
Q 8. Write two characteristics of positive rays or canal rays? OR Write any three properties of canal rays OR Give three properties of positive rays?

The properties of canal rays are as follows:

- They are positively charged.
- The nature of rays depend upon nature of gas present inside the discharged tube
- Mass of these particles was found equal to that of proton or simple multiple of it. Mass of proton is 1840 times more than that of electron

Q 9. Write a note on discovery of neutron? OR Who discovered neutron? Write its equation. OR Complete the equation ${}^{9}_{4}Be + {}^{4}_{2}He \longrightarrow$

in 1932, **Chadwick** discovered neutrons. He bombarded alpha particles on a Beryllium target and observed neutral and highly penetrating radiations. He called them neutrons.

$${}^{9}_{4}Be + {}^{4}_{2}He \longrightarrow {}^{12}_{6}C + {}^{1}_{0}n$$

Q 10. Write properties of Neutron. OR Write two characteristics of neutron.

- Neutrons carry no charge.
- They are highly penetrating.

Q 11. How electrons differ from neutrons?

Electrons	Neutrons
They revolves around nucleus of an atom and carry negative charge.	These are found in the nucleus and they carry no charge.
They are highly ionizing and less penetrating particles.	They are highly penetrating and less ionizing particles.
The mass of electron is 9.106×10^{-28}g	The mass of neutron is 1.672×10^{-24}g

Q 12. Differentiate between Rutherford and Bohr atomic model

Rutherford Atomic model	Bohr's atomic model
It was based on classical theory	It was based on quantum theory
According to this model Electron revolve around nucleus	According to this model Electron revolve around nucleus in orbitals of fixed energy
No idea about orbitals was introduced	Orbitals had angular momentum
Atom should produce continuous spectrum	Atoms should produce line spectrum
According to this model: "Atoms should collapse"	According to this model: "Atoms should exist"

Q 13. What were observations of Rutherford's experiment?

Following are the observations from Rutherford experiment:

1. Almost all the particles passed through the foil undeflected.
2. Out of 20,000 particles only a few were deflected at fairly large angles and very few bounced back on hitting the gold foil.

Q 14. What are the defects of Rutherford's atomic model?

1. According to Rutherford theory, electrons being the charged particles should

release energy continuously and they should ultimately fall into the nucleus. But in fact it doesn't happens.
2. If the electrons emit energy continuously, they should form a continuous spectrum but in fact, line spectrum was observed.

Q 15. As long as electron remains in an orbit, it does not emit or absorb energy. When does it emit or absorb energy? (OR) Write down any two postulates of Bohr's atomic theory?

According to Bohr's atomic Model

- Electrons move in a fixed orbit having fixed energy. As long as electron remains in a particular orbit, it does not radiate or absorb energy.
- The energy is emitted or absorbed only when an electron jumps from one orbit to another

Q 16. Why Max Planck was awarded Nobel Prize?

In 1918 noble prize in physics was awarded to German physicist Max Planck (1858-1947) for his work on the quantum theory.

Q 17. What does quantum mean?

Quantum means specific energy. It is small amount of energy that can be absorbed or released in the form of electromagnetic radiation.

Q 18. Write the name of particles which represents mass of atom? OR Where dose most of the mass of an atom exist?

The Fundamental particles which represent mass of an atom are present in nucleus are **Neutrons** and **Protons.**

Q 19. Calculate the value of angular momentum (mvr) of 1st orbit, where mvr=nh/2π.

The angular momentum is equal to mvr where

Mvr= $\frac{nh}{2\pi}$

Where h=6.63x10^{-34} and for first orbit n=1

$$Mvr = \frac{6.63 \times 10^{-34}}{2 \times 3.14}$$

Mvr=1.0x10^{-34} kgm^2 s^{-1}

So angular momentum=1.0x10^{-34} kgm^2 s^{-1}

Q 20. Differentiate between shell and subshell with examples of each?

Shells	Subshells
Shells are the main energy levels that electrons can occupy.	A shell also consists of **subshells** the number of subshells in a shell is equal to its n value.
They are represented by the alphabets K, L, M and so on.	Each subshell is represented by a small alphabetical letter s, p, d and f.

Q 21. How many maximum electrons accommodated in L and M shell?

In L shell maximum **8 electrons** can be accommodated
In M shell maximum **18 electrons** can be accommodated

Q 22. How many subshells are in 2nd shell?

There are two subshells present in 2nd Shell (L-shell) named as **s and p**

Write down number and names of subshells in N-shell?

There are four subshells present in N-shell named as **s, p, d** and **f**

Q 23. Define electronic configuration?

The distribution of electrons around the nucleus in various shells and sub shells according to their increasing energy, is called electronic configuration.

Q 24. The atomic symbol of a phosphorus ion is given as $^{31}_{15}P3-$?

- **How many protons, electrons and neutrons are there in the ion?**
- **What is name of the ion?**
- **Draw the electronic configuration of the ion.**
- **Name the noble gas which has the same electronic configuration as the phosphorus ion has.**

There are **15 protons**, **18 electrons** and **16 neutrons** in the ion.

Name: **phosphide.**

Electronic configuration: $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^6$

Noble gas which has same electronic configuration is **Argon**

Q 24 A. Write electronic configuration of following substances

Substances	**Atomic number**	**Electronic configuration**
Sulphur	16	$1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^4$
Chlorine	17	$1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^5$
Aluminum	13	$1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^1$
Nitrogen	7	$1s^2$, $2s^2$, $2p^3$
Oxygen	8	$1s^2$, $2s^2$, $2p^4$
Silicon	14	$1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^2$
Magnesium	12	$1s^2$, $2s^2$, $2p^6$, $3s^2$
Sodium	11	$1s^2$, $2s^2$, $2p^6$, $3s^1$
Fluorine	9	$1s^2$, $2s^2$, $2p^5$
Neon	10	$1s^2$, $2s^2$, $2p^6$
Beryllium	4	$1s^2$, $2s^2$
Phosphorus	15	$1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^3$
Chloride ion **Cl^-**	18	$1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^6$
Magnesium ion **Mg^{+2}**	10	$1s^2$, $2s^2$, $2p^6$
Aluminum ion **Al^{+3}**	10	$1s^2$, $2s^2$, $2p^6$

Q 25. Write down general electronic configuration of carbon family?

Ans: ns^2 , np^2

Q 26. Why magnesium tends to lose electrons? (OR) Magnesium has electronic configuration 2, 8, 2, how many electrons are in the outermost shell? In which subshell of the outermost shell electrons are present?

Ans:

There are **2 electrons** in outermost shell.

Its electronic configuration is **$1s^2$, $2s^2$, $2p^6$, $3s^2$.** Outer most electrons are present in **3s** subshell.

To complete its octet, Magnesium metal loses its 2 outer most electrons and attains noble gas electronic configuration to become stable.

Q 27. Define isotopes. What are isotopes of hydrogen?
Isotops are defined as the atoms of an element that have same atomic number and different atomic mass number.

- There are three isotopes of hydrogen as: Protium ($^{1}_{1}H$), Deutrium (2,1$^{2}_{1}H$), Tritium ($^{3}_{1}H$)
- While chlorine has two isotopes ($^{35}_{17}Cl$) and ($^{37}_{17}Cl$)

Q 28. Why do the isotopes of element have different atomic mass?
Isotopes differ in atomic masses due to different number of neutrons.

Q 29. Why mass number of same elements are different?
Mass number of same element may differ due to presence of different isotopes which have unequal number of neutrons.

Q 30. How many neutrons are in ^{12}C and ^{13}C?
In ^{12}C there are six 6 neutron while ^{13}C have seven 7 neutron.

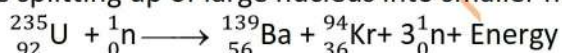
Q 31. Write 2 isotopes of chlorine?
Two isotopes of chlorine are ($^{35}_{17}Cl$) and ($^{37}_{17}Cl$)

Q 32. What is the symbol of Uranium? Write down name of its isotopes.
Symbol of uranium is U. Naturally occurring Isotopes of uranium are of atomic mass $^{234}_{92}U$, $^{235}_{92}U$, $^{238}_{92}U$

Q 33. State four uses of isotopes? OR How isotopes are useful for us(application)?
Uses of isotopes are as follows:

1. Isotopes are widely used in Radiotherapy
2. Isotopes are utilized in and geological use.
3. These are employed in chemical reaction and structure determination.
4. Isotopes are widely used in Power generation sector.

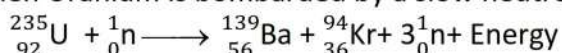
Q 34. Define nuclear fission reaction with one example? OR Define nuclear fission reaction, name new elements produced in it?
The splitting up of large nucleus into smaller nuclei is called a fission reaction

$^{235}_{92}U + ^{1}_{0}n \longrightarrow ^{139}_{56}Ba + ^{94}_{36}Kr + 3^{1}_{0}n + \text{Energy}$

Products: Elements **Barium** and **krypton**, **3 neutrons** and **energy** are produced in fission reaction above.

Q 35. How U-235 is broken by bombardment of neutron? Write chemical reaction? OR Complete the reaction $^{235}_{92}U + ^{1}_{0}n \longrightarrow$

OR Show by chemical reaction when slow neutron strikes uranium what happens?

When Uranium is bombarded by a slow neutron then Krypton and Barium are produced.

$^{235}_{92}U + ^{1}_{0}n \longrightarrow ^{139}_{56}Ba + ^{94}_{36}Kr + 3^{1}_{0}n + \text{Energy}$

Q 36. For what purpose U-235 is used?
U-235 radioactive isotope is used in power generation by carrying out controlled nuclear fission reactions in nuclear reactors.

Q 36 A. Give two examples of use of radio isotopes in cancer.

Two isotopes which are commonly employed in the treatment of cancer are:

Phosphorous-32 and **Strontium-90**

Q 37. Give application of isotopes in the field of medicine? OR Write down two uses of radioactive isotopes as tracers for diagnosis and medicine?
- Iodine-131 isotope is used for diagnosis of goiter in thyroid gland. The diagnosis is done by radiotherapy as Iodine-131 is radioactive element.

- Technetium is used to monitor the bone growth.

Q 38. A patient has goiter. How will it be detected? OR Give one example of the use of radioactive isotopes in medicine and radiotherapy?

- Iodine-131 isotope is used for diagnosis of goiter in thyroid gland. The diagnosis is done by radiotherapy as Iodine-131 is radioactive element.
- Technetium is used to monitor the bone growth.

Q 39. What is meant by carbon dating?

Carbon dating: Age determination of old carbon containing objects (fossils) by measuring the radioactivity of C-14 in them is called Carbon Dating.

- It is important in determining age of fossils (Dead plants and animal species) also in determining age of rocks (stones).

Periodic table and Periodicity of Properties

Q 1. Explain Doberenier's law of triads? OR How Doberneier arranged elements in periodic table?

Doberneier proposed that if elements are arranged in group of 3 elements such that the middle one has atomic mass average of the two then their periodic properties show repetition. He called these groups triads. This law is called law of triads.

Q 2. Write Newlands Law of Ocaves? OR How Newlands arranged elements? OR How Newland arranged elements?

The elements were arranged in ascending order of their atomic mass chemical properties of every eighth element show repetition.

Sodium (23) and potassium (31) have similar properties and potassium appears 8 elements after sodium.

Q 3. Why Nobel gasses do not react?

Nobel gasses do not react because they have stable electronic configuration, ns2 np6. Their outer most shell has 2 or 8 electrons naturally and they do not require further electrons to release or absorb so they do not take part in chemical reaction under usual conditions.

Q 4. What do you mean by groups and periods in the Periodic Table?

Groups:

The vertical columns in the periodic table are called **groups.**

Periods:

The horizontal rows of elements in the periodic table are called **periods.**

Q 5. Why Cesium (at. no.55) requires little energy to release its one electron present in the outermost shell?

Ans. Cesium is present at the bottom of first group. Due to its bigger size it has strong shielding effect and requires little energy to remove its one electron present in the outermost shell.

Q 6. What is the difference between Mendeleev's Periodic Law and Modern periodic law? OR Define Mendeleev Periodic Law? OR What is modern periodic Law?

Mendeleev Periodic law:

"Properties of elements are periodic function of their atomic masses"

According to its law Arrangement and properties of elements depends upon their Atomic Masses

Modern Periodic Law:

"Properties of elements are periodic functions of their atomic numbers"

According to this law arrangements and properties of elements depends upon their Atomic Number

Q 7. Write down demerits of Mendeleev's periodic table?

- Mendeleev's periodic table does not explain the position of isotopes.
- When the elements are arranged according to increase in their atomic masses, the order of certain elements becomes reversed.

Q 8. Atomic number is more fundamental property than atomic mass?

Atomic number is more fundamental than atomic mass because:

- It increases regularly from element to element.
- Atomic number is fixed for every element. While atomic mass may vary for same type of element.

For Example:

Atomic number of Hydrogen is fixed and equal to 1 but atomic mass may be 1, 2 or 3 amu.

Q 9. Write important features of modern periodic table.

- Periodic table consists of seven horizontal rows called periods.
- Elements in period show different properties
- There are 18 vertical columns in periodic table numbered 1 to 18 from left to right, which are called group
- The elements of a group show similar chemical properties.

Q 10. Define periodic law

Periodic Law: " The properties of the elements are periodic functions of their atomic numbers".

Q 11. Write number of groups and periods in the long form periodic table?

There are seven periods and 18 groups in periodic table.

Q 12. How many normal periods are and named also?

Second and third period are two normal periods in periodic table. They are so named because both have normal number (eight) of elements in each of them.

Q 13. Write down the elements of 1st period and their names and symbols also?

There are two elements in a period: Hydrogen (H), Helium (He)

Q 14. Write any four elements name in group 17.

The elements of group 17 are:

Fluorine (F), Chlorine (Cl), Bromine (Br) and Iodine (I)

Q 15. From which element Lanthanide series starts write its atomic number?

Lanthanide starts from element Lanthanum (La) whose atomic number is 57

Q 16. Write elements name in group 1st.

Four elements in 1st group are Hydrogen (H), Sodium (Na), Lithium (Li), potassium (K), Rubidium (Rb), Cesium (Cs) and Francium (Fr).

Q 17. Why and how are elements arranged in 4th period?

Ans. Elements in 4th period are arranged according to their atomic numbers because elements with similar periodic properties appear after regular intervals in periodic table. 4th period consist of 18 elements from potassium (K-19) to krypton (Kr-36). The elements in this period are arranged in ascending order of atomic number.

Q 18. Write the names of any four P-Block elements?

Ans Boron, carbon, nitrogen, oxygen.

Q 19. What are transition metals? OR What the elements from 3 to 12 group are called?

Ans: The elements from group 3 to 12 are called transition elements. Transition elements have properties intervening between s and p block elements.

Q 20. Write down two properties of long from of periodic table?

1. Periodic table consists of seven horizontal line called periods.
2. Elements of each period show different properties.

Q 21. What is meant by atomic sizes? What are their units? OR Define atomic radius with examples?

Half of the distance between the nuclei of the atoms is referred as the **atomic radius** of an atom.

Units: Commonly used units are Pico meter (1pm=10^{-12}m)

Example: Radius of carbon atom is 77pm

Q 22. Why atomic sizes decrease along period? OR Why atomic radius decrease along period? OR Write down atomic size trend in periodic table?

The effective nuclear charge goes on increasing along the period. As a result, nucleus pulls electrons towards it. So, size of atoms becomes small and continues to decrease along the period.

Q 23. Why does atomic size or radius decreases in a group?

Trends along group: The atomic radius increases from top to bottom in a group due to an addition of one more electronic shell at each step down the group which decreases the effective nuclear charge.

Q 24. How is periodicity of properties dependent upon number of protons in an atom?

Proton number or atomic number is used to arrange elements in periodic table. In this arrangement, the elements with similar properties appear after regular intervals. So the periodic properties of elements are function of their proton number.

Example: Group 1st shows valency of "1+" and appear after regular intervals when arranged w.r.t proton numbers.

Q 25. Why the size of atom does not decrease regularly in a period?

The size of atom does not decrease regular because of the discontinuity in **shielding effect.** When the size of atom reduces along period, the repulsion between outermost electrons and inner electrons also increases which limits further shrinkage of atom.

Q 26. Define shielding effect?

Shielding effect is the reduction of force of attraction between nucleus and outermost electron due to large number of electrons present between them.

Q 27. What is Trend of shielding effect in periodic table?

Shielding effect increases along the group and along periods it generally remains the same.

Q 28. Why shielding effect of electrons makes cation formation easy?

Shielding effect is the reduction of force of attraction between nucleus and outermost electron due to large number of electrons present between them. If the shielding effect becomes high then nucleus will not attract outermost electron with strong force which makes the removal of electron easy. Hence cation formation becomes easy due to shielding effect.

Q 29. Define ionization energy. Define ionization with one example?

The amount of energy required to remove the outermost electron bounded to an atom in gaseous state.

Example: $Na \longrightarrow Na^{+} + 1e^{-} \quad \Delta H=+496kjmol^{-1}$

Q 30. Write trend of ionization energy in groups and periods OR Trend of ionization in period?

Ionization energy increases along the period from left to right while it decreases from top to bottom along a group.

Q 31. Why ionization energy increase along a period?

If we move from left to right in a period, the Ionization energy increases. This is because the effective nuclear charge increases and the size of atom shrinks and this increases influence of nucleus on outermost electrons hence the removal of electrons becomes difficult.

Q 32. Why second ionization energy is higher than first ionization energy?
OR Why ionization energy of Na is less than that of Mg?
Ionization energy of sodium is less than that of magnesium because of following reason:
- Sodium is more electropositive than Magnesium
- There are two electrons in magnesium in outermost shell while sodium has only one. So It is easy to remove one electron.
- Size of Mg is smaller than sodium which increases influence of nucleus on outermost electrons making it difficult to remove electrons.

Q 33. What is relationship between electro positivity and ionization energy?
- Electro positivity character depends upon ionization energy., which in turn depends on size and charge of the atom.
- Small size atoms with high nuclear charge have high ionization energy, hence atoms having high ionization energy are less electropositive or less metallic.
- Alkali metals have the largest size and the lowest ionization energy in their respective periods. Therefore they have the highest metallic character.

Q 34. Define electron affinity, write effect of electron affinity in group?
OR Define electron affinity write its units? OR Define electron affinity? Give examples?
Electron affinity is defined as the amount of energy released when an electron is added in the outermost shell of an isolated atom gaseous atom.
Units: $KJmol^{-1}$
Example: $F + e^- \longrightarrow F^{-1} \quad \Delta H = -328KJmol^{-1}$

Q 35. Define electronegativity. Write electronegativity of fluorine and oxygen.
Definition:
Electronegativity is the ability of an atom to attract shared pair of electrons towards itself in a molecule is called electronegativity.
Electronegativity of fluorine is 4.0 and of nitrogen is 3.0 and for oxygen its 3.5.

Q 36. Write the trend of electronegativity in a period and group in periodic table?
Electronegativity increases from left to right along a period because of increase in effective nuclear charge. While from top to bottom, in a group, electronegativity decreases.

Q 37. Why the trend of electronegativity and electron affinity is same in period?
Electronegativity and Electron affinity increases from left to right along a period because increase in effective nuclear charge. Both electron affinity and electronegativity depends upon nuclear tendency to attract electron which increases with increase in effective nuclear charge in a period.

Structure of Molecules

Q 1. Why do atoms react? OR Why atoms make chemical bond?
It is a universal rule that every atom has natural tendency to become more stable. Atoms gain stability by attaining electronic configuration of nearest noble gas. Having 2 or 8 electron in valence shell is stable electronic configuration i.e. ns^2, np^6.

Q 2. How do atoms follow octet rule? OR How atoms accommodate 8 electrons in its valance shell?
- The attaining of 8 electrons configuration in the outer most shell either by sharing, by losing or by gaining electron is called octet rule.

- Atoms follow octet rule by participating in chemical bond formation either by sharing, losing or by gaining electrons to complete 8 electrons in outermost shell.
- The chemical bonds are as follows:
  Ionic bond, Covalent bond, Metallic bond

Q 3. Define chemical bond. What are its types?

A chemical bond is defined as a force of attraction between atoms that holds them together in a substance.

Types of chemical bond:

- Ionic bond covalent bond
- Coordinate covalent bond
- Metallic bond

Q 4. Differentiate between duplet and octet rule. OR Define Duplet rule.

Duplet rule	Octet Rule
Attaining two electrons in the valence shell is called duplet rule	Attaining eight electrons in the outermost shell is called Octet rule
This is prominent in atoms with only s-subshell	Octet rule is more common among the elements of periodic table
Example: Helium and hydrogen complete their outermost shell by duplet rule	**Example:** NaCl formation, O2 formation and Cl2 formation etc.

Q 5. Why is the bond between an electropositive and an electronegative atom ionic in nature? OR Why does sodium forms a chemical bond with chlorine?

Ionic bond is formed when a complete transfer of electrons takes place from one atom to another. An electropositive element has tendency to lose electron while an electronegative element has tendency to accept electron so they form positive and negative ion and combine chemically with each other forming ionic bond between them.

Q 6. Define covalent bond with examples?

The type of bond, which is formed due to mutual sharing of their electrons is called covalent bond.

Example: Formation of hydrogen, oxygen and nitrogen gas molecules are few examples of covalent bond.

Q 7. Describe at least two necessary conditions for the formation of a covalent bond?

The necessary conditions for the formation of covalent bond are:

1. Electronegativity of atoms must be high.
2. The ionization energy of elements must be high

Q 8. Explain the type of covalent bond with one example each OR What is a triple covalent bond, explain with an example?

Depending upon the number of bond pairs, covalent bond is classified into following three types:

Single covalent bond

When one electron is contributed by each bonded atom, one bond pair is formed and it forms a single covalent bond.

Example: Hydrogen gas H_2 , H-H

Double covalent bond

When each bonded atom contributes tw electrons, two bond pairs are shared and a double covalent bond is formed.

Example: Oxygen gas O_2 , O=O

Triple Covalent bond

When each atom contributes three electrons, there bond pairs are involved in bond formation. This type of bond is called triple covalent bond.

Example: Nitrogen gas N_2, N≡N

Q 9. What type of covalent bond is formed in nitrogen molecule?
Each nitrogen atom contributes three electrons to form **Triple covalent bond**.

Q 10. Point out the type of covalent bond in the following molecule. CH_4, C2H4, H_2, N_2 and O_2.

H_2, CH_4, single covalent bond

O_2, C_2H_4, double covalent bond

N_2, triple covalent bond

Q 11. More electronegative elements can form bonds between themselves. Justify? OR Why Oxygen molecule does not form a polar covalent bond?
More electronegative elements can share electrons to form non polar covalent bond between them. Electronegative elements attract electrons of each other and come close to each other such that these attractive forces between nucleus and electrons dominate to form a covalent bond.
Example: formation of chlorine and oxygen gasses Cl_2 and O_2

Q 12. Why a covalent bond becomes polar? Why has water polar Covalent bond?
When two different atoms combine, there will be difference of electronegativity between two covalently bonded atoms, there will be unequal attraction for the bond pair of electrons between such atoms. It will result in the formation of polar covalent bond.
Example:
HCL and H_2O

Q 13. Differentiate between ionic bond and covalent bond? OR Define covalent bond with examples? OR Define ionic bond with examples?

Ionic bond	Covalent bond
The type of chemical bond, which is formed due to complete transfer of electrons from one atom to another atom, is called ionic bond	The type of chemical bond, which is formed due to mutual sharing of electron, is called a covalent bond.
Ionic compounds are usually good conductors of heat electricity and are solids.	Covalent compounds are poor conductor of heat and electricity and usually exist in liquid or gaseous state.
NaCl is a good example of Ionic compound	Formation of hydrogen, oxygen and nitrogen gas.

Q 14. What is coordinate covalent bond? What is Dative covalent bonding?
The type of covalent bonding in which bond pair of electrons is donated by one bonded atom only.

Q 15. Differentiate between lone pair and bond pair of electrons?

Lone pair	Bond pair
The non-bonded electron pair available on an atom is called a **lone pair**.	The valence electrons, which are involved in chemical bonding, termed as **bonding electrons or bond pair.**
Lone pair is not utilized in bond formation	Bond pair is utilized in bond formation.
Example: The Lone pair in ammonia :NH_3 There is 1 lone pair in N_2 (lewis diagram)	**Example:** Three bond pair in in N—H bonds of ammonia (NH_3). There are 3 bond pairs in N_2 (lewis diagram)

Q 16. What is difference between polar and non-polar covalent bonds, explain with one example of each? Define Non polar covalent bond. Give example? OR Define polar covalent bond. Give example?

Non-Polar covalent bond	Polar covalent bond
If a covalent bond is formed between two similar atoms the shared pair of electrons is attracted by both the atoms equally. Such type of bond is called **nonpolar** covalent bond.	If the covalent bond is formed between two different types of atoms then the bond pair of electrons will not be attracted equally by the bonded atoms. Such type of bond is called **polar** covalent bond.
For example, bond formation in H_2 and Cl_2.	For example: water, hydrogen fluoride and hydrogen chloride.

Q 17. What is meant by metallic bond?

The **metallic bond** is defined as a bond formed between metal atoms (positively charged ions) due to mobile or free electrons.

Properties of metallic bond:

None of the outermost electron is bound to any particular atom.

The electrons are mobile and like the pool and nucleus being submerged in it.

Q 18. Define intermolecular forces. OR What are van der Waals forces?

The forces of attraction present between the molecules of substance are called van der Waals forces or intermolecular forces.

Types:

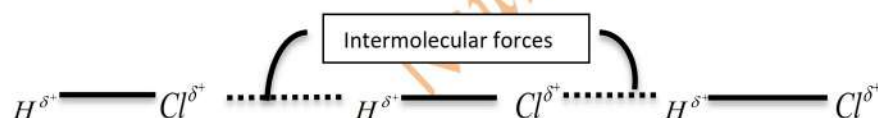
Dipole-dipole forces

Hydrogen bonding

Example:

Dipole-dipole forces between HCl molecule and hydrogrn bonding between molecules of HCl

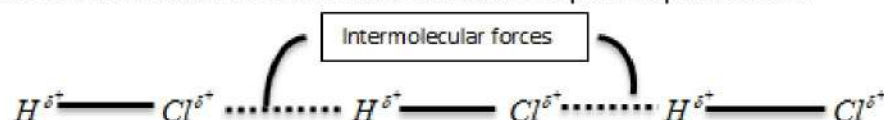
Q 19. What is dipole dipole forces. Explain with example?

In a polar molecule the partial positive and partial negative charges exists at different position in a molecule. They attract the oppositely charged ends of adjacent molecules. These forces are called dipole dipole forces.

Example: KCL and NaCl are ionic compounds and are solids in nature.

Q 20. Why HCl has dipole-dipole forces of attraction?

Dipole-dipole forces of attraction exists between molecules of HCl. Because of large difference of electronegativity unequal sharing of electron bond pair takes place. As a result Hydrogen gets partial positive and Chlorine partial negative charge. In this way, electrostatic forces of attractions develops between the molecules of HCl. These are called Dipole-Dipole forces.

Intermolecular forces

$H^{\delta+}$ — $Cl^{\delta+}$ .... $H^{\delta+}$ — $Cl^{\delta+}$ .... $H^{\delta+}$ — $Cl^{\delta+}$

Q 21. Define Hydrogen bonding and give examples?

Partially positively charged hydrogen atom of one molecule attracts and forms a bond with partially negatively charged atom of the other molecule, the bonding is called **hydrogen bonding.**

Example:

Hydrogen in following attracts the partially negative oxygen of other molecule

- Hydrogen bonding is prominent in **water**.
- **Alcohol.** Also shows weak hydrogen bonding.

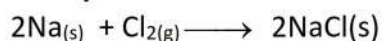
Q 22. Why does ice float on water?
The density of ice at 0 °C (0.917 gcm^{-3}) is less than that of liquid water at 0°C (1.00gcm^{-3}). In the liquid state water molecules move randomly. However, when water freezes, the molecules arrange themselves in an ordered form, that gives them open structure. This process expands the molecules, that results in ice being less dense as compared to water. Due to this reason ice floats on water.

Q 23. Give the characteristic properties of ionic compounds?
- Ionic compounds are mostly crystalline solids.
- Ionic compounds in solid state have negligible electrical conductance but they are good conductors in solution and in the molten form. It is due to presence of free ions in them.
- Ionic compounds have high melting and boiling points.
- They dissolve easily in polar solvents like water.

Q 24. Which compounds do not exist in independent molecular from?
Ionic compound do not freely in independent molecular state.

Q 25. Ionic compounds conduct electricity in solution or molten form. Why?
Ans. Ionic compounds conduct electricity because in solution or molten form they exists in the form of positive and negative ions which move freely throughout the fluid and hence they facilitate the flow of electricity through them

Q 26. Why ionic compound has high melting and boiling point?
Force of attraction i.e electrostatic force of attraction in ionic compounds are strong so high energy require to break ionic bond. So melting point and boiling point of these compounds are higher.

Q 27. Ionic compounds are solids. Justify.
Ans. Ionic Compounds Consists of positively and negatively charged ions. They are held together by strong electrostatic forces of attraction to form a solid or crystalline structure. So ionic compounds are solids at room temperature.
Example: The formation of NaCl:
$2Na_{(s)} + Cl_{2(g)} \longrightarrow 2NaCl(s)$

Q 28. What characteristic properties does the covalent compound have?
1. They have usually low melting and boiling points.
2. They are usually bad conductors of electricity.
3. They are usually insoluble in water but are soluble in non-aqueous solvents like benzene, ether, alcohol and acetone.
4. Large molecules with three dimensional bonding form covalent crystals which are very stable and hard. They have very high melting and boiling points.

Q 29. Write two properties of coordinate covalent compounds?
1. Covalent compounds have low melting and boiling points.
2. Pure covalent compounds are bed conductors of electricity but some polar covalent compounds are good conductors of electricity in aqueous form.

Q 30. Why electrons move freely in the metals?
In metal the hold of nucleus over the outermost electron is weak because of large size atoms and greater number of shells in between nucleus and valence electrons because of low ionization potentials metals have the tendency to lose their outer electrons easily. Resultantly these loose or free electrons of all metal atoms move freely in space between atoms of a metal.

Q 31. Metals are good conductor of electricity. Why?
Metals are good conductor of electricity due to the presence of free electrons which are mobile (moving) throughout the metal. The free movement of electrons facilitate the flow of electric current through metal. So they are good conductors of electricity.

Chapter 5

Physical States of Matter

Q 1. Write two properties of liquid state of matter?

i- Liquids have fixed volume but no fixed shape. It attains the shape of container in which it is kept.
ii- Particles of liquids are much farther apart than those of solids.

Q 2. Write two elements which exist in gaseous state?

The following elements exist in gaseous state:

1. Helium (He)
2. Neon (Ne)

Q 3. Write the names of two elements which exist in liquid state at normal temperature.

The elements which naturally exist in liquid form at room temperature are:

1. Bromine (Br)
2. Mercury (Hg)

Q 4. Why liquids are mobile?

Liquids are mobile because the intermolecular forces in liquid are less as the intermolecular spaces present in liquids. Moreover the motion of molecules is random motion. This makes liquids mobile.

Q 5. What is effusion? Prove it with example.

Definition:
Escaping of gas molecules, through a tiny hole toward the area of low pressure is called effusion.
Effusion depends upon the molecular mass of gases.
Example : when tyre get punctured, all air effuses out

Q 6. Differentiate between effusion and diffusion.

Diffusion	Effusion
Diffusion is defined as the spontaneous mixing up of molecules of a substance by random motion and collisions to form a homogeneous mixture.	It is the escaping of gas molecules through a tiny hole into a space with lesser pressure.
It is a slow process.	It is generally faster than diffusion.

Q 7. Define pressure write its units

Pressure is defined as "the force acting per unit surface area".
Its units are Nm^{-2} or pascal (Pa)

Q 8. Define standard atmospheric pressure. What are its units? (OR) How it is related to Pascal? (OR) Define standard atmospheric pressure. What are its units?

It is defined as the pressure exerted by a mercury column of 760 mm height at sea level.
One atmospheric pressure (atm):
1atm=760mmHg
As 1mmHg=1torr
1atm=760torr
Pascal (Pa):

1atm= 101325Nm^{-2}
1 Pa= 1Nm^{-2}
1atm=101352 Pa

Q 9. Convert 700mmHg into atmospheric pressure (atm).

We know that

$$760mmHg = 1atm$$

So for 700mmHg,

OR

$$1mmHg = \frac{1}{760} atm$$

$$700 \times 1mmHg = 700 \times \frac{1}{760} atm$$

$$700mmHg = \frac{700}{760} atm$$

Finally, **700mmHg=0.92atm**

Q 10. Convert the 3.5 atm to torr.

Ans: 3.5 atm to torr.

$$1atm = 760torr$$

Multiply both side by 3.5
3.5 × 1atm =3.5 × 760=2660 torr.
3.5atm=2660torr

Q 11. In which unit body temperature is measured?

Body temperature is usually measure either in degree centigrade.

Q 12. What do you mean by mobility of gases?

The gases molecules have high kinetic energies and low intermolecular forces. So gas move randomly and they are not held at fixed place like solids. As a result the gas is continuously in motion. This is called mobility of gas.

Q 13. What is compressibility?

Compressibility is the ability of substance (usually gases) to undergo change in volume and shape when external force is applied on it.
For example:
Gasses are highly compressible due to empty spaces between their molecules

Q 14. Why the gasses are compressed?

Gasses are compressed because compressed gass occupies less volume and has more density. So we can change these physical parameters of gas according to our desire by compressing the gas. That's why gases are compressed.

Q 15. Why the gasses are Compressible?

Gasses are highly compressible due to empty spaces between their molecules. When external force is applied on enclosed gas then empty spaces are filled and it decreases the volume hence gas becomes compressed.

Q 16. Increasing pressure decreases the volume why?

When the pressure on a gas is increased it is compressed. It is due to the empty spaces present between the molecules of a gas. So increasing the pressure pushes the molecules closer hence total volume occupied by gas is reduced.

Q 17. Define Boyle's law verify with example?

Volume of a given mass of a gas is inversely proportional to its pressure provided the temperature remains constant.
$V \alpha (1/P)$
$V = k/P$
Verification:
For the same gas at given temperature, we know according to boyle's law:
$P_1V_1=P_2V_2$
For a gas kept in enclosed container at pressure 2atm and total volume 1dm3. If pressure is increased to 4atm volume becomes 0.5 dm3. Similarly, the following readings obtained
P_1V_1=2atm x 1dm^3=2atmdm^3
P_2V_2= 4atm x 0.5dm^3= 2atmdm^3
Hence proved
$P_1V_1=P_2V_2$

Q 18. What is Charle's law? Write its equation.

The volume of a given mass of a gas is directly proportional to the absolute temperature if the pressure is kept constant.
V=kT or

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

Q 19. What is absolute temperature write its value?

The temperature measured with respect to absolute zero is called absolute temperature.
Its units are kelvin represented by k

Q 20. Convert 50^oC into Kelvin scale?

We know that:

$$T_K = T^o + 273$$

=50+273
=323K
Temperature in kelvin=323K

Q 21. Convert the 373k into centigrade (^oC).

$$T^o = T_K - 273$$

=373-273
=100^{o}C
Temperature in centigrade =100^{0}C.

Q 22. Convert -20^{0}C to Kelvin temperature?

We know that,

$$T_K = T^o + 273$$

$= T^0C + 273$
$= -20+273$
$= 253\ K$

Temperature in kelvin=253K

Q 23. Convert -45^{0}c to Kelvin temperature?

We know that:

$$T_K = T^o + 273$$

$= T^0C + 273$
$= -45 + 273$
$= 228K$

Temperature in kelvin=228K

Q 24. Convert 30^{0}C to Kelvin temperature?

Ans:

$$T_K = T^o + 273$$

$= 30 + 273$
$= 303K.$

Temperature in kelvin=303K

Q 25. Convert -30^{0}C to Kelvin?

$$T_K = T^o + 273$$

$= -30 + 273$
$= 243K$

Temperature in kelvin=243K

Q 26. What is absolute zero? Write its value

Absolute zero is a hypothetical temperature at which the volume of a gas becomes zero. The value of absolute zero is 0k or -273^{o}C.

Q 27. Define evaporation?

The process of changing of a liquid into a gas phase is called evaporation.
For example one mole of water in liquid state is converted into vapour form it requires 40.7KJ energy

$H_2O_{(l)} \longrightarrow H_2O_{(g)} \qquad \Delta H^o_{vap} = 40.7 KJmol^{-1}$

Q 28. Evaporation increases with increase in temperature?

At high temperature, rate of evaporation is high because at high temperature kinetic energy of the molecules increases so high that they overcome the intermolecular forces and evaporate rapidly. So evaporation increases with the increase in temperature.

Q 29. Describe two factors upon which evaporation depends?

Evaporation depends upon following factors
Surface area:

Evaporation is a surface phenomenon. Greater is the surface area, greater is evaporation.

Temperature:

There would be more evaporation at high temperatures because of increased kinetic energy and decrease intermolecular forces.

Q 30. Evaporation cause cooling why?

Evaporation is the continuous escaping of high energy molecules of from liquid to vapour state. When high energy molecules escape from liquid we are left with less energy molecules of substance so overall cooling takes place by evaporation.

Q 31. What do you mean by evaporation how it is affected by surface area?

The process of changing of a liquid into a gas phase is called evaporation.

Surface area: If surface area is increased the rate of evaporation will also increase. Because increasing the surface area facilitate the escape of large number of molecules from liquid surface in the form of vapours.

For example, sometimes a saucer is used if tea is to be cooled quickly. This is because evaporation from the larger surface area of saucer is more than that from the smaller surface area of tea cup.

Q 32. What is vapour pressure?

The pressure exerted by the vapours of a liquid at equilibrium with the liquid at a particular temperature is called **vapour pressure** of a liquid.

Q 33. Describe two factors affecting vapour pressure of a liquid?

Vapour pressure of a liquid depends upon following factors:
Nature of liquid
Temperature

Q 34. What is the effect of temperature on Vapour pressure? OR Why vapour pressure is greater at higher temperature?

Vapour pressure develops due to the pressure developed at the surface of liquid by molecules of liquid in vapour state. If the temperature of liquid is increased then more molecules are converted into vapours and hence increasing vapour pressure.

Q 35. Write down the chemical formula of silicon dioxide and calcium chloride?

Silicon dioxide SiO_2, Calcuim chloride $CaCl_2$.

Q 36. Define dynamic equilibrium? OR Show the State of dynamic equilibrium in liquid and vapour with the help of diagram.

The stage at which the number of molecules evaporating becomes equal to the number of molecules coming back to liquid. This is called dynamic equilibrium state.

At dynamic equilibrium,

Liquid Vapours

Q 37. What do you mean by condensation?

A process of change of gaseous state into liquid is known as condensation.
It is reverse of evaporation.

Q 38. What is difference between freezing point and boiling point? Define boiling point of liquid? OR Define boiling point. Give boiling point of alcohol?

Freezing point	Boiling point
Freezing point is the temperature at which the liquid and solid states of the substance exist in equilibrium.	The temperature at which the vapour pressure of the liquid becomes equal to atmospheric pressure or external Pressure.
For example freezing point of water H_2O is 0^oC below which water becomes solid ice.	Boiling point of Alcohol is 78^oC Boiling point of water is 100^oC

Q 39. What is boiling point. How it varies with altitude from sea level? OR Define boiling point and write effect of external pressure?

The temperature at which the vapour pressure of the liquid becomes equal to atmospheric pressure or external Pressure.

Variation in Boiling point:

By increasing altitude external pressure reduces due to reduce in concentration of air. As a result Boiling point also reduces at high altitudes.

Q 40. How do intermolecular forces affect the boiling points of a liquid?

Intermolecular forces play a very important role in the boiling point of liquids. Substances having stronger intermolecular forces have high boiling points, because such liquids attain a level of vapour pressure equal to external pressure at high temperature.

Q 41. Why the water has higher boiling point than ether?

The intermolecular forces in water are higher than those in ether, that is why water has higher boiling point as compared to ether.

Q 42. Differentiate between boiling point and melting point? Define melting point.

Boiling Point	Melting Point
The temperature at which the vapour pressure of the liquid becomes equal to atmospheric pressure or external Pressure.	Melting point is the temperature at which the solid state and liquid state of the substance exists in dynamic equilibrium.
Example: Boiling point of Alcohol is 78^oC	**For example:** Melting point of water is 0^oC

Q 43. What is difference between evaporation and boiling point of a liquid?

Evaporation	Boiling point
The process of changing of a liquid into a gas phase is called evaporation.	The temperature at which the vapour pressure of the liquid becomes equal to atmospheric pressure or external Pressure.
If more heat is supplied to liquid, its rate of evaporation increases.	The boiling point of a liquid is constant at a given pressure
Dependence:	Dependence:
Temperature, surface area, intermolecular forces	External pressure, type of liquid

Example:	. Example:
one mole of water in liquid state is converted into vapour form it requires 40.7KJ energy $H_2O_{(l)} \longrightarrow H_2O_{(g)}$ $\Delta H^o_{vap} = 40.7 KJmol^{-1}$	Boiling point of Alcohol is 78°C Boiling point of water is 100°C

Q 44. What is the relationship between evaporation and boiling point of a liquid?

Boiling point of substance is a special stage of evaporation of that substance that no more liquid should exist above that temperature.

Q 45. Why is the boiling point of water higher than Alcohol?

The boiling point of water is higher than that of alcohol because of the presence of Hydrogen Bonding in water. Alcohol has weak intermolecular forces of attraction which are not much effective as is the hydrogen bonding between water molecules. This strong forces makes the boiling point of water higher than that of alcohols.

Q 46. Define freezing point?

Freezing point is the temperature at which the liquid and solid states of the substance exist in equilibrium.
For example freezing point of water H_2O is 0°C below which water becomes solid ice.

Q 47. What is diffusion? explain with an example.

Diffusion is defined as spontaneous mixing up of molecules by random motion and collisions to form a homogeneous mixture. Liquids diffuse like gases but the rate of diffusion of liquid is very slow.
For example, when a few drops of ink are added in a beaker of water, ink molecules move around and after a while spread in whole of the beaker. Thus diffusion has taken place.

Q 48. Which factors affect the diffusion of a liquid. Explain two? Explain any two factors which affect diffusion?

Diffusion of a liquid depends upon following factors:

- Intermolecular forces
- Size of molecules
- Shape of molecule
- Temperature

Q 49. Why diffusion in gasses is more as compared to liquids? OR Why diffusion in liquids is slow as compared to gasses?

Gasses diffuse more as compared to liquids because:

- Gases have weak intermolecular forces as compared to liquids.
- The size of molecules of gas is usually small than those of liquid compounds which remains in solid size.

Q 50. Why are the densities of gases lower than that of liquids?

Gases have low density as compared to liquids and solids. It is because:

- Gasses have less mass and more volume.
- There are large spaces present between molecules of gas and possess random motion while Liquids have small intermolecular spaces and have molecules vibratory motion.
- Liquids have strong intermolecular forces as compared to gas.

Q 51. What is the effect of temperature on density of gasses? OR Does the density of gas increases by decrease in temperature?

According to Charles Law, temperature of a gas is directly proportional to its volume keeping pressure constant. Because when temperature decreases, kinetic energy decreases and attractive forces increase. We know that,

$V=\frac{m}{d}$ So, volume is inversely related to density.

So decrease in temperature decreases volume which in turn decreases density and vice versa.

Q 52. Solids are rigid than liquids why? OR Why solids show rigidity?

Particles of liquid don't have fixed position while the particles of solid are not mobile. They have fixed positions. Therefore, solids are rigid in their structure.

Q 53. Why is the density of gas measured in gdm^{-3} while that of liquid in gcm^{-3}?

The density of gas is less than that of liquid, that is why density of gas is expressed in gdm^{-3} and that of liquid in gcm^{-3}.

Q 54. Why drops of rain fall downward?

Rain consists of water drops which have more density $1.0gcm^{-3}$ as compared to density of air which is $0.001gcm^{-3}$. So water moves downward in air because water is heavier than air.

Q 55. Define amorphous solids give two examples.

Solids in which particles are not regularly arranged or their regular shapes are destroyed are called amorphous solids.

Examples: Plastics, rubber, glass etc.

Q 56. Define crystalline solids give its two examples?

Solids in which particles are arranged in a definite three-dimensional pattern are called crystalline solids.

Examples: diamonds, sodium chloride and sugar etc.

Q 57. Write any two properties of crystalline solids?

Following are important properties of crystalline solids:

i. They have definite surfaces or faces with definite angle between surfaces.

ii. They have sharp melting points.

Q 58. Define amorphous solids give two examples? OR Define the term allotropy with examples?

The existence of an element in more than one form in same physical state is called **allotropy.**

Allotropes of oxygen are oxygen (O_2) and ozone (O_3), sulphur has two allotropic forms rhombic and monoclinic

Q 59. Define the term allotropy.

The existence of an element in more than one forms in same physical state is called **allotropy.**

Q 60. Write two reasons of allotropy?

Allotropy is due to:
The existence of two or more kinds of molecules of an element each, having different number of atoms such as allotropes of oxygen are oxygen (O_2) and Ozone (O_3)
Different arrangement of two or more atoms or molecules in a crystal of the element. Such as Sulphur shows allotropy due to difference in arrangement of molecules S8 in the crystal.

Q 61. State whether allotropy is shown by elements or compounds? Or both.

The existence of an element in more than one form in same physical state is called allotropy.
Allotropy is always shown by the molecules of an **element**. For example, Oxygen O_2 and O_3 are allotropic form of element oxygen.

Q 62. Define transition temperature?

The temperature at which one allotropy changes into another allotropy.
Example:

S_8(rhombic) $\xrightarrow{96^oC}$ S_8(monoclinic)

Q 63. In which form sulphur exists at 100 °C?

Transition temperature of sulphur is 96 °C. Below this temperature rhombic form is stable. If rhombic form is heated above 96 °C, its molecules rearrange themselves to give monoclinic form. **So at 100 °C monoclinic form exists**.

Solutions

Q 1. Difference between solution and mixture? Define solution? OR What is solution?

Solution	Mixture
Solution is a homogeneous mixture of two or more substances.	The piece of matter in impure form is called mixture.
It has uniform composition throughout.	Mixture may be heterogeneous or homogeneous.
Example: Sugar in water, metal alloys and air etc.	**Example:** Soil, water and sugar solution and suspension of paints etc

Q 2. Why does solution consider as a mixture?

Mixture is mixing up of two or more substances which with each other.
Solution is a particular type of mixture of two or more substances which homogeneous mixtures.
Common Properties:
Both solution and mixture have:

i. Variable composition.
ii. They show the properties of their constituent.
iii. Constituent do not react chemically

Q 3. Differentiate between solute and solvent? OR Define Solute. Give example? OR Define Solvent?

Solute	Solvent
A component of solution which is present in smaller quantity is called solute.	The component of solution which is present in larger quantity is called solvent
Solute is dissolved in a solvent	Solvent always dissolves solute
Example: In water salt solution salt is solute because it is in less quantity	**Example:** In water salt solution, water is solvent.

Q 4. What is difference between saturated and unsaturated solution?

Saturated Solution:	Unsaturated solution:
A solution containing maximum amount of solute at a given temperature is called **Saturated Solution**	A solution which contains lesser amount of solute than that which is require to saturate it at a given temperature, is called unsaturated solution.
Dynamic equilibrium of solute in solution exists	No dynamic equilibrium of solute in solution exists
Example: 20.9g salt in 100cm3 of water at 20°C.	**Example:** 10g of salt in 100cm3 of water at 20°C- solution has capacity to dissolve more solute

Q 5. What is supersaturated solution?

The solution that is more concentrated than a saturated solution is known as **supersaturated solution.** Supersaturated solution is obtained by dissolving more solute in solution at elevated temperatures.
For example: saturated solution of Na2S2O3 in water at 20°C has 20.9g of salt per 100cm^3. Super saturated solution can be obtained by dissolving more than 20.9g of Na2S2O3 at elevated temperature.

Q 6. What is solid-liquid solution? Explain with example

A solid liquid solution has solute in solid form and solvent as liquid.
Example: Sugar in water solution has water as solvent as liquid and sugar as solute.

Q 7. Write down two example of liquid in gas solution? OR Write down example of a solution in which solute is liquid and solvent is gas?

- Mist
- Fog

Q 8. What is solid-solid solution? Give two example?

A solid-solid solution is one in which both solute and solvent are in solid form..
Example:

- Metal alloys
- Opals

Q 9. Define aqueous solution. Write the two components of solution?

The solution which is formed by dissolving substance in water is called aqueous solution.
Components of solution:
Water as Solvent
Solute

Q 10. Differentiate between aqueous solution and solution?

aqueous solution	Solution

The solution which is formed by dissolving substance in water is called aqueous solution.	Solution is a homogeneous mixture of two or more substances.
Example: Sugar in water and table salt in water	**Example:** Metal alloys and air etc.

Q 11. Differentiate between concentrated and dilute solutions?

Concentrated solution	Dilute solution
Concentrated solution are those which contains relatively large amount of dissolved solute in the solution	Dilute solution are those which contain relatively small amount of dissolved solute in the solution
Brine is concentrated solution of common salt in water	Smoke in air is an example of dilute solution of smoke and air.

Q 12. What is meant by Brine?

Brine is the concentrated solution of Common salt NaCl in water.
The solution is true solution in nature. Temperature has minimum effect on solubility of solute in this solution.

Q 13. Define molarity. Write its unit and give example?

It is a concentration unit defined as "*number of moles of solute dissolved in one dm3 of the solution.*"
Its unit is "$molKg^{-1}$"
It is represented by **M**
Molarity (M)= No. of moles of solute/Volume of solution(dm^3)

Q 14. What type of solution fog and brass are?

Substance	Solute state	Solvent state	Remarks
Fog	Liquid	Gas	It is liquid in gas colloidal solution
Brass	Solid	Solid	It is solid in solid solution.

Q 15. Define Molarity write formula to prepare molar solution?

It is a concentration unit defined as "*number of moles of solute dissolved in one dm3 of the solution.*"
One molar solution is prepared by following steps:

- Add one mole of the solute in minimum amount of solute.
- Dissolve the solute by adding more solvent to make total volume of solution equal to $1dm^3$ in measuring flask
- One molar solution is prepared.

Q 16. How one molar solution of NaOH is prepared?

One molar solution of NaOH is prepared by following steps:

- Add 40g of the NaCl in water such that it Dissolve the NaCl by adding more solvent to make total volume of solution equal to $1dm^3$ in measuring flask
- One molar solution is prepared

Q 17. How much NaOH is required to prepare its $500cm^3$ of 0.4 M solution?

Ans: Molar mass of NaOH = 40gmol-1. volume in dm3 = $500cm^3/1000cm^3 * 1dm^3 = 0.5dm^3$

Molarity=mass of solute in gram/molar mass(gmol-1) *volume of solution (dm^3)

mass of solute = molarity*molar mass of solute * volume of solution =0.4*40*0.5 = 8g

Q 18. How much sodium hydroxide (NaOH) is required to prepare its 500cm3 of 0.4M solution?

Ans: Molar mass of NaOH = $40gmol^{-1}$

volume dm3 =$500/1000cm^3*1dm^3$

$0.5dm^3$

Molarity=mass of solute(g)/molar mass (gmol-1)*volume of solution 9dm^3)

Mass of solute= molarity*molar mass* volume of solution

=0.4*40*40*0.5+8g

Q 19. How much volume of 0.1M solution is required if you are asked to prepare a solution of 0.1 molar having volume 100cm3?

Ans: M1 = 0.1

v1 =?

M2 =0.01

v2 =$100cm^3$

M1V1 =M2V2

Q 20. How can you prepare 1 dm3 solution of NaOH having 0.5M molarity?

Ans: Molar mass of NAOH = 40

mass of solute= molarity x molar mass of solute x volume of solution

=0.5x40x1=20g.

Q 21. 5cm3 acetone is dissolved to prepare 90cm3 aqueous solution. Calculate the percentage v/v of the solution?

Ans: Concentration =volume of solute/volume of solution*100

$$= \frac{5}{90} X100 = 5.5$$

Q 22. Why formula of solute is necessary for computation of molarity of solution?

For one molar solution preparation there must be:

- Number of moles of solute.
- Volume of solvent

For determination of number of moles we must be given with molar mass of solute which can be found by chemical formula of a substance.

Q 23. Write the names of ways in which concentration units are expressed?

Concentration units can be expressed as:

- Percentage
- Molarity

In percentage concentration unit can be further expressed as:

Percentage mass/mass

Percentage mass/volume

Percentage volume/mass

Percentage volume/volume

Q 24. What is meant by percentage mass by volume (%m/v)

It is the number of grams of solute dissolved in 100cm3 parts of volume of the solution.

%m/v = mass of solute*100/volume of solution

10% **m/v** sugar sugar solution contains 10g of sugar in 100cm3 of solution.

Q 25. What do you mean by percentage volume by volume (%v/v)

It is the volume in cm3 of a solute dissolved per 100cm3 of the solution.
%volume/ volume= volume of solute *100 /volume of solution
For example 30% alcohol solution means 30cm3 of alcohol dissolved in sufficient volume of water to make total volume of solution 100cm3

Q 26. Distinguish between (%v/v) and (%m/m)

%volume/volume	%mass/mass
It is the volume in cm^3 of a solute dissolved per $100cm^3$ of the solution.	It is the number of gram of solute in 100 grams of solution.
%volume/ volume= volume of solute *100 /volume of solution	% mass/mass= mass of solute*100/ mass of solution
For example 30% alcohol solution means 30cm3 of alcohol dissolved in sufficient volume of water to make total volume of solution 100cm3	For example: 10% m/m sugar solution means that 10g of sugar is dissolved in 90g water to form 100g of solution

Q 27. What is meant by percentage volume by mass (%v/m)

The volume in cm^3 of a solute dissolved in 100g of the solution.
%v/m = Volume of solute*100/mass of solution (g)
10% v/m alcohol solution in water mean 10 cm^3 of alcohol dissolved in 100g of solution.

Q 28. What do you mean by percentage mass by mass (%m/m)

It is the number of gram of solute in 100 grams of solution.
% mass/mass= mass of solute*100/ mass of solution
For example: 10% m/m sugar solution means that 10g of sugar is dissolved in 90g water to form 100g of solution

Q 29.Define Solubility. Which factors affect the solubility of solute?

Solubility is defined as *"the number of grams of the solute dissolved in 100g of a solvent to prepare a saturated solution at a particular temperature."*
The factors on which solubility depends are as follows:

- Principle of solubility, like dissolves like.
- Solvent-solute interaction.
- Temperature.

Q 30. Justify with an example that solubility of a salt increases with the increase in temperature?

Ans. When salts like KNO_3, $NaNO_3$ and KCl are added in water, the test tube becomes cold. It means during dissolution of these salts heat is absorbed. Such dissolution is called 'endothermic dissolution'.

Effect of temperature:

It means that heat is required to overcome the attractive forces between the atoms of solute. More the heat is supplied, more is the dissolution takes place hence it favors solubility of solute.

Q 31. What do you mean, like dissolves like? Explain with examples

Like dissolves like means:
The ionic and polar substances are soluble in polar solvents. e.g. common salt, sugar, and alcohol are all soluble in water.
Non-polar substances are not soluble in polar solvents. e.g. ether, benzene, and petrol are insoluble in water.
Non-polar covalent substances are soluble in non-polar solvents. e.g. Grease and paints are soluble in ether and carbon tetrachloride.

Q 32. How does nature of attractive forces of solute-solute and solvent-solvent affect the solubility?

Ans. If the new forces between solute and solvent particles overcome the solute-solute attractive forces, then solute dissolves and makes a solution. If forces between solute particles are stronger than solute-solvent forces, solute remains insoluble and solution is not formed.

Q 33. What is general principle of solubility?

Generally solubility principle is:

Like dissolves like

It means that a ionic and polar substance dissolves in polar substance and non-polar substance dissolves in nonpolar substance.

Example: Salt is soluble in water while it is insoluble in CCl_4

Q 34. How meat is preserved? OR Why salt is used to preserve meat?

Meat can be preserved by process called salting. In this method the meat is socked in concentrated solution of salt such as brine. Concentration of salt up to 20% is required to kill most species of unwanted bacteria. This process is helpful in preserving food because most of bacteria, fungi and other organisms cannot survive in salted conditions.

Q 35. Write down the chemical formula of ammonia and sugar.

Ammonia=NH_3

Suggar = $C_6H_{12}O_6$

Q 36. Why water is called universal solvent?

Water can dissolve most of the substances found in nature. That's why it is regarded as the universal solvent.

Q 37. Why is iodine soluble in CCl_4?

Solubility of substance followed by solubility principle which is *a polar substance dissolves polar substance.* Iodine is polar solute and CCl_4 is also a polar substance. So CCl_4 can easily dissolve in Iodine, both being polar substances.

Q 38. Why test tube becomes cold when KNO_3 is dissolved in water?

Dissociation of KNO3 in water is endothermic. So when KNO_3 is dissolved in water then the heat from surrounding is absorb by the solution because solute requires some amount of heat to be dissolved in solvent to form a solution.

Solute + solvent + heat → solution

Q 39. Effect of temperature on solubility?

Change in solubility greatly depends upon whether the dissociation of solute in the solution is exothermic or endothermic.

- If dissociation is endothermic then increasing temperature increases solubility
- If dissociation is exothermic and decreasing temperature increase solubility

Q 40. Why test tube becomes warm when Li_2SO_4 is dissolved in water?

When **Li_2SO_4** is dissolved in water then the heat is released during dissolution. This is because the attractive forces among the solute particles are weaker and solute-solvent interactions are stronger. So the heat is released because ions of **Li_2SO_4** are more stable in solution form. They become stable in solution and release energy.

Q 41. How you can explain the solute-solvent interaction to prepare a NaCl solution?

When NaCl is added in water it dissolves readily because the attractive interaction between the ions of NaCl and polar molecules of water are strong enough to overcome the attractive forces between Na+ and Cl - ions in solid NaCl crystal.

In this process, the positive end of the water dipole is oriented towards the Cl - ions and the negative end of water dipole is oriented towards the Na+ ions. These ion-dipole attractions are so strong that they pull these ions from their positions in the crystal and thus NaCl dissolves.

Q 42. Why are colloids stable? Give two examples?

Colloid solution remains unchanged for a long time and its particles do not cling together or settle down in solution. This is due to the repulsion of particles and they have low kinetic energy so the particles remain dispersed in colloidal solution.

Examples:

- Soap solution- solution soap and water
- Blood- solution of blood cells and serum

Q 43. How will you test whether given solution is a colloidal solution or not?

A colloidal solution shows Tyndall effect. When the light is passed through the solution sample it scatters the beam of light indicates the solution is colloidal.

Q 44. How would you explain that the given solution is colloid?

On basis of these observations the solution will be colloidal.

- Given solution is colloidal solution when it shows Tyndall effect
- The particles can easily pass through filter paper.
- Particles could not be seen by naked eye.

Q 45. Write 4 examples of colloidal solutions?

Following are the Common examples of colloidal solution:

1. Soap solution 2. Blood 3. Ink 3. Jelly

Q 46. What is Tyndall effect? On what factors it depends?

Tyndall effect is the scattering of light rays when they pass through a solution with relatively large size. This is a characteristic property of colloids.

Dependence: It depends upon **size** and **concentration** of particles.

Q 47. Why colloids show Tyndall effect?

In colloids, the size of particles is so small that they cannot be seen by naked eye rather they scatters the light passing through them and hence show scattering effect of light also called Tyndall effect.

Q 48. Why true solution does not show Tyndall effect?

Tyndall effect is the scattering of light rays when they pass through a solution with relatively large size. True solutions do not show Tyndall effect because the size of particles of solute is so small that the light easily passes through it.

Q 49. How would you explain that milk is a colloid?

- Milk is colloidal solution because it shows Tyndall effect.
- On basis of these observations Milk is Colloid.

Q 50. Differentiate between true solution and colloids?

True Solution	Colloid
Solution is the homogeneous mixture of two or more than two components.	The solution in which solute particles are larger than those present in the true solution but not large enough to be seen by naked eye.
Due to small particle size they don't show Tyndall effect	They show Tyndall effect (scattering of light)
Example: drop of milk in water, NaCl in water	**Examples:** Starch soap solutions and blood.

Q 51. What is meant by suspension? Explain with example?

Suspensions are heterogeneous mixture of un-dissolved particles in a given medium.
Particles are big enough to be seen by naked eye.
Examples are:
Paints, milk of magnesia and chalk-water etc.

Q 52. Why the suspension does not form a homogeneous mixture?

The particles of solute present in suspension remain undissolved in solvent. Due difference in densities of solute and solvent particles, the solute settles down in the mixture making it heterogeneous mixture rather than homogeneous mixture.

Q53. Why we stir paints thoroughly before using?

Ans. Paints are examples of suspensions. Particles of solute are of big size and have more density than solvent. As a result they settle down separating from solution. So, we need to stir it thoroughly to make suspension uniform before use.

Q 54. Which of the following will scatter light and why? Sugar solution, soap solution and milk of magnesia

Ans. sugar solution is a true solution. Soap solution is a colloid and milk of magnesia is a suspension. Only soap solution will scatter light because it is colloidal solution.

Q 55. Write 2 properties of suspension?

Suspension are heterogeneous mixture of undissolved particles in a given medium.
Solute particles cannot pass through filter paper

Q 56. Compare 2 characteristics of solution and suspensions?

Solutions	Suspension
Solution is homogeneous mixture of two or more substances and has one phase.	Suspension are heterogeneous mixture of undissolved particles in a given medium.
Solute particles can easily pass through filter paper	Solute particles cannot pass through filter paper

Q 57. Differentiate solution and suspension?

Solution	Suspension
Solution is a homogeneous mixture of two or more substances.	Suspensions are a heterogeneous of undissolved particles in a given medium.
Particles are so small that they cannot scatter the rays of light passing through it	Particles are so big that light is blocked and difficult to pass.
Example: salt in water, sugar in water	Example: chalk in water, paint and magnesia

Q 58. Differentiate between colloid and suspension?

Colloid	Suspension
The solution in which solute particles are larger than those present in the true solution but not large enough to be seen by naked eye.	Suspensions are heterogeneous mixture of undissolved particles in a given medium.
They show Tyndall effect (scattering of light)	They does not show Tyndall effect because of their large size
Examples: Starch soap solutions and blood.	**Example:** Drop of ink in water, NaCl in in water.

Q 59. Classify the following into true solution and colloidal solution: Blood, starch solution, glucose solution, toothpaste, copper sulphate solution, silver nitrate solution.

True Solution: **glucose solution, copper sulphate solution, silver nitrate solution.**

Colloidal solution: **Blood, starch solution, toothpaste.**

Q 60. Give two characteristics of colloids?

The important properties of colloids are as follows:

The particles are large consisting of many atoms, ions and molecules.

Particles scatter the path of light rays thus emmiting beam of light and they exhibit Tyndall effect.

Q 61. What is the reason for the difference between solutions, colloids and suspensions?

The basic reason of difference between solution, colloid and suspension is the **particle size of the solute** present in each of them. They show different properties due to change of particle size of solute. Suspension has large sized particles, colloid has medium and solution has small sized solute particles.

Q 62. Why suspensions and solutions do not show Tyndall effect, while colloids do?

In case of solution the particles of solute are so small that they cannot scatter the beam of light passing through them while in case of suspension the particles are large enough to be seen by naked eye and they rather block the light passing through them. On the other hand particles in colloid are bigger but cannot be seen by naked eye. So, they scatter the light passing through them which is called **tyndall effect.**

Electrochemistry

Q 1. Define electrochemistry?

Electrochemistry is the branch of chemistry that deals with the relationship between electricity and chemical reactions.

It involves oxidation and reduction reactions, called *redox* reactions.

Q 2. Differentiate between spontaneous and non-spontaneous reaction?

Spontaneous reaction	Non-spontaneous reaction
Spontaneous reactions are those which take place on their own without external agent.	Non-Spontaneous reactions are those which take place in the presence of some external agent (e.g. electrical energy)
Example: Reaction in Electrolytic cell	Example: Reaction in Galvanic cell.

نَحْمَدُہٗ وَ نُصَلِّی عَلٰی رَسُوْلِہِ الْکَرِیْم

معزز اساتذہ کرام، السلام علیکم ورحمۃ اللہ! گزارش ہے کہ سٹوڈنٹس کو مطالعہ سے پہلے درج ذیل دعاؤں کو باقاعدگی سے پڑھنے کی ترغیب دیں۔ جزاک اللہ۔

عزیز طلبا و طالبات، آپ سب بھی دعاؤں کا اہتمام ضرور کریں۔ اللہ تعالی آپ سب کے اور اساتذہ کرام کے علم، زندگی اور ایمان میں برکت دے۔ آمین۔

ہمارے لیے بھی دعا کرتے رہیں۔ اللہ تعالیٰ ہم سب کے لیے دنیا و آخرت میں آسانیاں اور سکون نصیب فرمائے۔

بِسْمِ اللّٰہِ الرَّحْمٰنِ الرَّحِیْمِ ط

اللہ کے نام سے شروع جو رحمٰن ورحیم ہے۔

اَللّٰھُمَّ صَلِّ عَلٰی مُحَمَّدٍ وَّعَلٰٓی اٰلِ مُحَمَّدٍ کَمَا صَلَّیْتَ عَلٰٓی اِبْرٰھِیْمَ وَعَلٰٓی اٰلِ اِبْرٰھِیْمَ اِنَّکَ حَمِیْدٌ مَّجِیْدٌ○ اَللّٰھُمَّ بَارِكْ عَلٰی مُحَمَّدٍ وَّعَلٰٓی اٰلِ مُحَمَّدٍ کَمَا بَارَکْتَ عَلٰٓی اِبْرٰھِیْمَ وَعَلٰٓی اٰلِ اِبْرٰھِیْمَ اِنَّکَ حَمِیْدٌ مَّجِیْدٌ○

رَبِّ اشْرَحْ لِیْ صَدْرِیْ○ وَیَسِّرْ لِیْٓ اَمْرِیْ○ وَاحْلُلْ عُقْدَۃً مِّنْ لِّسَانِیْ○ یَفْقَھُوْا قَوْلِیْ○

رَبِّ زِدْنِیْ عِلْمًا۔ رَبِّ زِدْنِیْ عِلْمًا۔ رَبِّ زِدْنِیْ عِلْمًا۔

اَللّٰھُمَّ اِنِّیْٓ اَسْئَلُكَ عِلْمًا نَّافِعًا وَّرِزْقًا طَیِّبًا وَّ عَمَلًا مُّتَقَبَّلًا○

آخر میں درود شریف دوبارہ پڑھیں۔

اللہ تعالیٰ آپ کو جزا دے، آپ کے علم کے حصول میں آسانیاں عطا فرمائے۔

Q 3. Which force derives the Non Spontaneous reaction to take place?

Primarily, non-spontaneous reaction require external agent to occur. This external agent is electrical energy. So these reactions are derived by the electrical energy.

Example:

Reaction occurring in Galvanic cell is an important example of non-spontaneous reaction.

Q 4. What is redox reaction?

A chemical reaction in which oxidation and reduction processes are involved is called Oxidation-reduction reaction or redox reaction

For example:

$2ZnO + C \longrightarrow 2Zn + CO_2$ Here carbon is oxidized and Zn is reduced

Q 5. Explain the term oxidation on basis of electronic concept with example?

Oxidation is the loss of electrons by an atom or an ion e.g

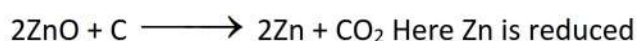
$Zn \longrightarrow Zn^{+2} + 2e$

$Fe^{+2}_{(aq)} \longrightarrow Fe^{+3} + e^-$

Q 6. Define reduction?

Reduction is defined as addition of hydrogen or removal of oxygen during chemical reaction.

It is the gain of electron by some specie

$2ZnO + C \longrightarrow 2Zn + CO_2$ Here Zn is reduced

Q 7. Define reduction on basis of accepting or losing hydrogen or oxygen.

Reduction is defined as addition of hydrogen or removal of oxygen during chemical reaction.

Example: $2ZnO + C \longrightarrow 2Zn + CO_2$ Here Zn is reduced

Q 8. Differentiate between oxidation and reduction?

Oxidation	Reduction
Oxidation is defined as addition of oxygen or removal of hydrogen during a chemical reaction	Reduction is defined as addition of hydrogen or removal of oxygen during chemical reaction
It can also be explain as loss of electrons	It is the gain of electron
$2ZnO + C \longrightarrow 2Zn + CO_2$ Here Carbon is oxidized	$2ZnO + C \longrightarrow 2Zn + CO_2$ Here Zn is reduced

Q 9. Where there is oxidation there is reduction explain?

Oxidation and reduction are simultaneous processes. In a redox reaction when one substance is oxidized then the other one will always be reduced and vice versa. Consider the following reaction:

$$2ZnO + C \longrightarrow 2Zn + CO_2$$

Here Zn is reduced and Carbon is oxidized at the same time.

Q 10. What is difference between valency and oxidation state?

Oxidation state is the apparent charge assigned to an atom of an element in a molecule or in ion.

It is represented as first writing nature (plus or minus) of charge then magnitude of charge.

Example: In HCl oxidation number of H is +1 and that of Cl is -1

Valency is the apparent charge on an atom, ion or molecule.

It is represented as first writing magnitude of charge then nature (plus or minus) of charge.

Example: Hydrogen ion (H^+) and Chloride ion (Cl^-) Here Valency is 1+ and 1- for hydrogen and chlorine respectively

Q 11. Calculate the oxidation number of Sulphur in $CaSO_{4?}$?

The oxidation of Hydrogen= +2
Oxidation state of oxygen =-2
Net oxidation state=0
So, (+2)+x+(-2)4=0
X=+6
So oxidation state on suphur is +6

Q 12. Determine oxidation state of Sulphur in H2SO4

The oxidation of Hydrogen= +1
Oxidation state of oxygen =-2
Net oxidation state=0
So, 2(+1)+x+(-2)4=0
X=+6
So oxidation state on suphur is +6

Q 13. Find out oxidation number of nitrogen in HNO_3 when: H=+1,O=-2

(oxidation number H) + (oxidation number N) + 3 (oxidation number of O) = 0
(+ 1) + oxidation number of N + 3 (-2) = 0
1 + oxidation number of N - 8=0
oxidation number of N=6-1=+5

Q 14. Calculate the oxidation number of oxygen in OF_2?

The oxidation number of O in OF_2 is +2

Q 15. Calculate the oxidation number of Mn of $KMnNO_4$

(oxidation number of K) + (oxidation number of N)+ 3(oxidation number of O) +0
1+Mn + 4(-2)=0
1+Mn + (-8)=0
Mn = + 8 - 1
Mn =+7

Q 16. Find out the oxidation number of chlorine in $KClO_3$.

Ans:
(oxidation number of K) + (oxidation number of Cl) + 3 (oxidation number of O)=
(+1)+Cl+3(-2)=0
Oxidation number of Cl =6-1
Oxidation number of Cl =+5

Q 17. Differentiate between oxidizing agent and reducing agents?

Reducing agent	Oxidizing agent
Reducing agent is a substance that oxidizes itself and reduces other in a redox reaction.	Oxidizing agent is a substance that reduces itself and oxidizes other in a redox reaction
Example: in redox reaction, $2H_2 + O_2 \longrightarrow 2H_2O$	Example: in redox reaction, $2H_2 + O_2 \longrightarrow 2H_2O$

Hydrogen behaves as reducing agent	Oxygen behaves as oxidizing agent

Q 18. What is electrochemical cell? Write name of its types?

Electrochemical cell is a system in which two electrodes are dipped in the solution of an electrolyte which is connected to battery.

It is energy storing device which stores chemical energy.

It is of two types:

1) Electrolytic cell
2) Galvanic cells

Q 19. Define electrolytes, also give one example.

Those substances which allow to pass electricity through their solution or molten form are known as electrolytes.

Example: Solution of acid, bases and salt are good electrolytes

Q 20. Write formulas of two strong electrolytic compounds?

Formulae of two strong electrolytes are: NaCl, NaOH.

Q 21. Identify a strong and weak electrolyte among the following compounds?

$CuSO_4$ $C(OH)_2$ HCl HNO_3

Strong electrolyte: HCl, HNO_3, $CuSO_4$

Weak electrolyte: $Ca(OH)_2$

Q 22. What is electrolysis give one example.

The chemical decomposition of a compound into its components by passing current through the solution of the compound or into the molten state of the compound.

Examples:

Electrolysis of water: $2H_2O \longrightarrow 2H_2 + O_2$

Q 23. Differentiate between electrolyte and non-electrolyte?

Electrolytes	Non electrolytes
The substances, which can conduct electricity in their aqueous solutions or in their molten states are called **electrolytes**	The substances, which cannot conduct electricity in their aqueous solutions or in their molten states are called **non-electrolytes**
These are ionized in water.	These do not dissociate in water in the form of ions
Example: NaCl solution, KCl solution in water	**Example:** benzene or iodine mixture in water.

Q 24. Differentiate between strong and weak electrolytes?

Weak electrolyte	Strong Electrolyte
The electrolytes which ionize to a small extent when dissolved in water and could not produce more ions are called weak electrolytes	The electrolytes which ionize almost completely in their aqueous solutions and produce more ions, are called strong electrolytes
Example: Acetic acid (CH_3COOH) and Calcium hydroxide $Ca(OH)_2$	**Example:** Aqueous Solution of NaCl, H_2SO_4, NaOH

Q 25. Write down name of any two weak electrolytes?

Two weak electrolytes are Acetic acid (CH_3COOH) and calcium hydroxide ($Ca(OH)_2$)

Q 26. Define weak electrolytes and give examples?

The electrolytes which ionize to a small extent when dissolved in water and could not produce more ions are called weak electrolytes

Example:

Acetic acid (CH_3COOH) and Calcium hydroxide $Ca(OH)_2$

Q 27. Identify the electrolyte and non-electrolyte from the following:

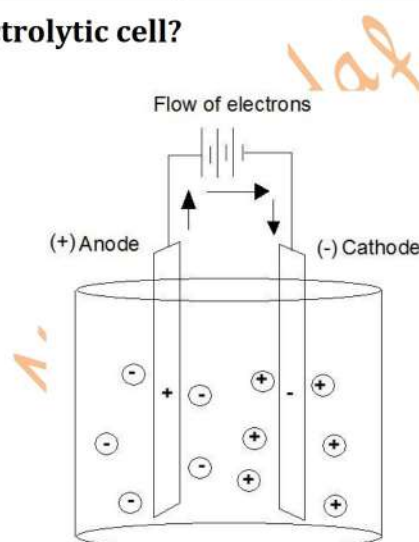
(1) Sugar (2) Glucose (3) Benzene (4) Sodium chloride

Electrolyte =glucose, sodium chloride

Non-electrolyte=sugar, benzene

Q 28. What is difference between electrolytic cell and galvanic cell?

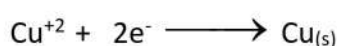
Electrolytic cell	Galvanic cell
The type of electrochemical cell in which a non-spontaneous chemical reaction takes place when electric current is passed through the solution, is called an electrolytic cell	The electrochemical cell in which spontaneous chemical reaction takes place and generates electric current is called galvanic or voltaic cell.
Anode is positive(+)Oxidation Cathode is negative(-)Reduction	Anode is negative(-)Oxidation Cathode is positive(+)reduction

Q 29. Draw a diagram of an electrolytic cell?

Q 30. What is the deference between anode and cathode?

Anode	Cathode
The electrode in an electrochemical cell at which oxidation occurs is called anode.	The electrode in electrochemical cell at which reduction occurs is called cathode.
It is connected to positive terminal of battery in electrolytic cell.	It is connected to negative terminal of battery in electrolytic cell.

Q 31. What happens on cathode in galvanic cell?

At cathode of galvanic cell reduction takes place. As a result usually a metal is deposited over cathode. In Daniel cell the cathode is of Copper which undergoes reduction as follows:

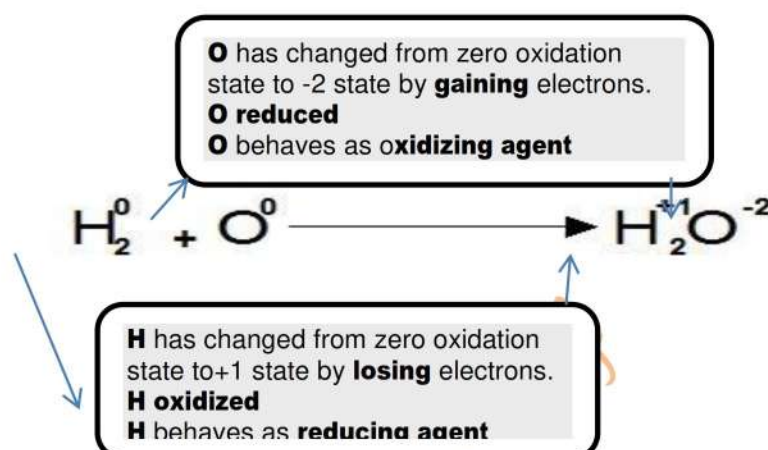
$$Cu^{+2} + 2e^{-} \longrightarrow Cu_{(s)}$$

Q 32. Which substance is oxidized and which substance is reduced in 2Na + 2 Cl ⟶ 2NaCl

In the redox reaction:

$2Na + 2\,Cl \longrightarrow 2NaCl$

Here Sodium Na is oxidized as it loses an electron in redox reaction

Chlorine Cl is reduced because it accepts electron in redox reaction

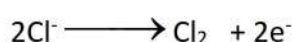
Q 33. $H_2^0 + O^0 \longrightarrow H_2^{+1}O^{-2}$ **Find out the atoms that are oxidized or reduced in above reaction?**

Q 34. Write chemical reaction which takes place during working of nelson's cell

Nelson's cell use Brine to produce NaOH. The following reactions take place in Nelson's cell:

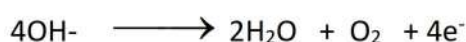
Brine ionizes to produce ions:

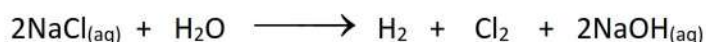
$NaCl_{(aq)} \longrightarrow 2Na^+ + 2Cl^-$

Reaction at anode (oxidation):

$2Cl^- \longrightarrow Cl_2 + 2e^-$

Reaction at cathode (reduction):

$4OH- \longrightarrow 2H_2O + O_2 + 4e^-$

$2Na+ + 2OH^-_{(aq)} \longrightarrow 2NaOH_{(aq)}$

Overall cell reaction of this process:

$2NaCl_{(aq)} + H_2O \longrightarrow H_2 + Cl_2 + 2NaOH_{(aq)}$

Q 35. What type of reaction takes place at anode in electrolytic cell?

In an electrolytic cell, oxidation reaction occurs at anode.

Electrons are discharged at anode

For example:

When fused salt NaCl is electrolyzed then oxidation reaction at anode occurs and Cl_2 gas is released at anode.

Q 36. Why valency of chlorine is one?

The valency of chlorine is 1- because Atomic Number of chlorine is 17 with configuration 2,8,7

Since **Chlorine** has 7 electrons in its **valence** shell it would take much less energy to acquire an electron

and reach the stable 8 electrons in a shell configuration rather than losing its 7 electrons. Hence the **valency of Chlorine is 1-**

Q 37. Are anodes of downs cell and nelsons cell are made of same material? If yes then write its name?

Yes anodes of Down's cell and Nelson's cell are made up of same material which is Graphite.

Q 38. Which by products forms in nelson's cell?

Chlorine gas and Fused **sodium metal** are formed in nelson's cell.

Q 39. How sodium metal is collected in Down's cell?

In Down's cell, sodium metal floats on the denser molten salt mixture from where it is collected in a side tube.

Q 40. What is the name of by product in downs cell?

The byproduct produces in Downs Cell is Chlorine gas.

Q 41. Which method is used to get sodium metal? Write equation of this cell?

Down's Cell is used to extract sodium metal from fused NaCl.

$2NaCl \rightarrow 2Na^+ + 2Cl^-$

$2Cl^- \longrightarrow Cl_2 + 2e$

$2Na^+ + 2e \longrightarrow 2Na$

Overall reaction:

$2NaCl \longrightarrow Cl_2 + 2Na$

Q 42. Write down the products obtained from downs cell?

Final products obtained from downs cell can be explained by:

The overall reaction of downs cell:

$2NaCl_{(fused)} \longrightarrow Cl_{2(g)} + 2Na$

Q 43. Define corrosion.

Corrosion is slow and continuous eating away of a metal by its surrounding medium.

Example:

Corrosion of iron (also called rusting)

Corrosion of Aluminum

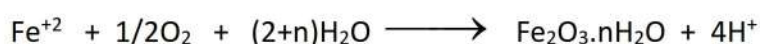
Q 44. What is meant by rusting?

Corrosion of iron is called Rusting. Rusting is continuous eating away of iron.

Description:

In the process of rusting iron is ionized and the air from surrounding supplies oxygen to form oxides of iron which are red flakes of oxides called rust

The overall rusting process is:

$Fe^{+2} + 1/2O_2 + (2+n)H_2O \longrightarrow Fe_2O_3.nH_2O + 4H^+$

Q 45. What is difference between corrosion and rusting?

Corrosion	Rusting
Corrosion is slow and continuous eating away of a metal by its surrounding medium.	Corrosion of iron is called Rusting.

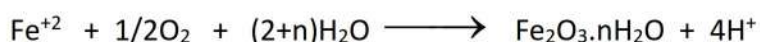
Q 46. What does happen to iron in rusting process?

In the process of rusting iron is ionized and the air from surrounding supplies oxygen to form oxides of iron which are red flakes of oxides called rust. Following is the chemistry of rusting

$Fe \longrightarrow 2Fe^{+2}_{(aq)} + 4e-$

$O2 + 4H^{+} + 4e^{-} \longrightarrow 2H_2O$

$Fe + O_2 + 4H^{+} \longrightarrow 2Fe^{+2} + 2H_2O$

$Fe^{+2} + 1/2O_2 + (2+n)H_2O \longrightarrow Fe_2O_3.nH_2O + 4H^{+}$

Q 47. Why O_2 is necessary for rusting?

The process of rusting is followed by formation of rust. Where rust is red flakes of iron oxide. So in order to form Oxides of iron Oxygen must be supplied.

Q 48. How iron is prevented from rust by tin coating?

It involves dipping of clean sheets of iron in a both of molten form of tin and then passing it through hot roller. The tin protect the iron only as long as its protective coating remains intact, once it is broken and iron is exposed, iron rust rapidly.

Q 49. What is meant by metallic coating?

The depositing of one metal over the surface of other metal to form a thin layer on its surface is called Metal coating.
It is done by physical or Electrolytic methods.

Q 50. Why the iron grill is painted?

Iron surface is painted because it prevents the rusting of iron. Paints cover the surface of iron and they prevent the exposure of surface to oxygen and moisture. They also protect iron against weathering.

Q 51. Write down the uses of paints and grease.

Polishing and painting of surfaces can prevent the corrosion of iron, with the development of technologies modern paints contains a combination of chemicals called stabilizers, that provides protection against corrosion in addition to prevention against weathering and other atmospheric effects.

Q 52. Why metals are coated?

Metals are coated for the following purposes:
Preventing the surface from rusting
To facilitate long time preservation of food in metal containers.

Q 53. What is mean by alloying? OR What is meant by alloy? Give example?

Alloy is homogeneous mixture of one metal with one or more other metals or non-metals. The process of formation of alloy is called alloying.

Example:

Stainless steel is an alloy of iron with chromium and nickel.

Q 54. What is difference between steel and stainless steel?

Steel	Stainless steel
Steel is an alloy of iron and other metals to impart desired properties in it.	Stainless steel is an alloy of iron, chromium and nickel to produce rust resistant alloy of iron
It has good Malleability and ductility than simple iron	It is rust resistant and has good properties and is used widely

Q 55. Where do the electrons flow from zinc electrode in Daniel's cell?
Daniel cell consists of Zn anode and Copper cathode. Zn metal has tendency to lose electrons more than copper has. So oxidation takes place at Zn-electrode and it loses electrons which moves through external circuit. These electrons are accepted by copper in other half cell.

Q 56. What is salt bridge what is its basic function?
The function of salt bridge is to keep the solutions of two half cells neutral by providing a pathway for migration of ions.

Q 57. Define galvanizing and write down its advantage?
Definition:
The process of coating thin layer of zinc over iron is called galvanizing.
Function:
Galvanizing is done to protect iron from getting rusted
A chief advantage of galvanizing is that the iron surface remains protected from corrosion even if the coating damages or breaks

Q 58. Why does galvanizing is done? OR What is advantage of galvanizing?
Galvanizing has wide applications.
- It is used to protect the iron against corrosion even after the coating surface is broken
- It gives pleasant finishing to metal surface.

Q 59. Which metal is use to galvanize the iron?
Two metals are commonly used to galvanize iron
Zinc
Tin

Q 60. What is meant by electroplating?
Electroplating is depositing of one metal over the other metal by means of electrolysis.
Example:
- Electroplating of silver
- Electroplating of chromium

Q 61. What is electroplating? Write down the procedure of electroplating.
Electroplating is depositing of one metal over the metal by means of electrolysis.
The process of electroplating is described below:
The metal to be electroplated is **cleaned**. Anode of precious metal, cathode of iron and salt electrolyte are used to establish **electrolytic cell**. The final step is to supply **electric power**.

Q 62. How electroplating of tin on steel is carried out?
Steel is placing in container, containing a solution of tin salt. The steel is connected to a electrical acting as cathode. While the other electrode current is passed through circuit, tin metal ion present in solution, deposit on steel.

Q 63. How electroplating of chromium is carried out?
A clean piece of Chromium is set as cathode
Anode is composed of the metal which is to be electroplated like antimonial-lead.
Electrolyte in Chromium electroplating is sulphuric acid
Both anode and cathode are dipped inside electrolyte supplied with electric power source.
Chromium ions move in solution from anode and deposited on cathode.

Q 64. Which salt is used as electrolyte in electroplating of chromium?

The aqueous solution of chromium sulphate ($Cr(SO_4)_3$) is used as an electrolyte in Chromium electroplating.

Q 65. What is the nature of electrode used in electroplating of chromium?

In electroplating of chromium, the cathode is made up of chromium and anode is made up of antimonial lead.

Q 66. How impure copper is refined to pure copper?

Copper is refined through electrolytic process impure copper act as anode and pure copper acts as cathode. The solution of copper sulphate acts as electrolytic.

Chemical Reactivity

Q 1. Defines metals.

Metals are the elements (except hydrogen) which are electropositive and form cations by losing electrons.

Examples:

Sodium, zinc, iron, copper and magnesium etc.

Q 2. Why the ionization energy of metal is low?

Ionization energy of metal is low because of the following reasons:

- They are comparatively large sized and large shielding effect.
- Metals have less effective nuclear charge and less influence on outer most electrons. So they can be easily removed.

Q 3. Write the names of two metals which are most ductile and malleable?

The most ductile and malleable metals are gold and silver.

Q 4. State two properties of metals?

1. They are good conductor of heat and electricity.
2. They easily lose electrons and form positive ions.

Q 5. Write four physical properties of metals? OR Write down two physical properties of metals?

- Almost all metals are solids(except mercury).
- They have high melting and boiling points.(except alkali metals)
- They are good conductor of heat and electricity.
- They easily lose electrons and form positive ions.

Q 6. Write chemical properties of metals?

- They easily lose electrons and form positive ions
- They readily react with oxygen to form basic oxides.
- They usually form ionic compounds with non-metals.

Q 7. Which is the most precious metal?

Platinum is the most precious metal.

Q 8. Write down four very reactive metals?

The name of very reactive metals are:
Potassium, sodium, calcium, magnesium and aluminum.

Q 9. Write down the names of four least reactive metals.

Least reactive: Copper, Mercury, silver, gold

Q 10. What do you mean by malleability?

The property of metal with which its shape can be deformed by applying external force or stress is called malleability of metal.
Soft metals can easily be deformed so they are highly malleable
Example: Sodium is malleable but gold is the most malleable metal of periodic table.

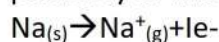
Q 11. What is meant by electropositivity write its trend in period? OR Why metallic Character decreases along a period from left to right in a periodic table?

Metallic character decreases along the period because size of atoms increases. While in a period metallic character decreases from left to right.
For example:
Sodium has more metallic character than Magnesium next to it in second period.

Q 12. Write the trend of electro positivity in a group?
OR How does metallic character changes along group in periodic table
OR Why does Electro positivity increase from top to bottom in a group?

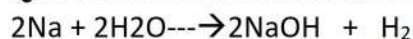
Electropositivity depends upon size of the atom. Increasing size decreases effective nuclear charge and hence increases electro positivity.
In a group while moving from top to bottom, the size of atom increases and effective nuclear charge decreases. So, electropositivity increases down the group.
Example:
Lithium is less electropositive than Cesium which lies at bottom of group 1.

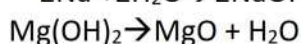
Q 13. Define metallic character?

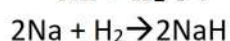
Metals have the tendency to lose their valance electrons. This property of a metal is termed as electro positivity or metallic character.
$Na_{(s)} \rightarrow Na^+_{(g)} + le^-$

Q 14. How electropositivity depends on nuclear charge of an atom? OR Relationship between electropositivity and ionization energy

Electropositive character depends upon the ionization energy which in turn depends upon size and nuclear charge of the atom. Small sized atoms with high nuclear charge have high ionization energy value.

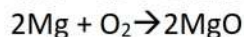
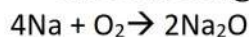
Q 15. Write down reaction of sodium with following H_2O, O_2, Cl_2 H_2

$2Na + 2H_2O \text{---}\rightarrow 2NaOH + H_2$
$4Na + O_2 \text{-------}\rightarrow 2Na_2O$
$Na_2O + H_2O \text{--}\rightarrow 2NaOH$
$2Na + Cl_2 \text{_---}\rightarrow 2NaCl$
$2Na + H_2 \text{----}\rightarrow 2NaH$

Q 16. Complete the following chemical equations. $Na+H_2O\rightarrow?$, $Mg(OH)_2\rightarrow?$, $Na+H_2O\rightarrow?$

$2Na + 2H_2O \rightarrow 2NaOH + H_2$
$Mg(OH)_2 \rightarrow MgO + H_2O$

Q 17. Complete and balance the given chemical equation:
$Na + H_2 \rightarrow ?$

$2Na + H_2 \rightarrow 2NaH$

Q 18. Write a chemical reaction of Na and Mg with oxygen (O_2). OR Complete and balance the following equation $Mg + O_2 \rightarrow$

$4Na + O_2 \rightarrow 2Na_2O$

$2Mg + O_2 \rightarrow 2MgO$

Q 19. Why Magnesium is harder than Sodium?

Magnesium is divalent (Mg^{+2}) while sodium is monovalent (Na^{+1}). In crystal lattice, sodium shows one bond per one atom and magnesium shows two bonds per one atom. Due to the ability of magnesium to form large number of bonds than sodium, it becomes harder, compact structure, durable and less malleable than sodium.

Q 20. Why ionization energy of sodium is greater than potassium?

Small sized atoms with high nuclear charge have high ionization energy value. That is the reason potassium have the large size and the low ionization energy while sodium is small size.

Q 21. How will you compare the electro positivity of alkali metals and alkaline earth metals?

Alkaline earth metals have small size of atom and less nuclear charge than alkali metals. As a result alkaline earth metals have high ionization energy than alkali metals. So, electro positivity of alkaline earth metals is less than that of alkali metals.

Q 22. Why sodium metal is more reactive than Mg metal?

Sodium metal is more reactive than Magnesium because it has only one electron in outermost shell that is ns^1 while mg has 2 electrons in outermost shell that is ns^2 . As it is easy to remove one electron because further removal of electron requires more energy. That's why Na is more reactive than Mg

Q 23. Reactivity of metals increases down the group? OR Why reactivity of the metals increases down in the group? OR Which group metals is highly reactive and why? OR Why alkaline earth metals are less reactive than alkali metals?

The reactivity of metals depends upon the electro positivity or metallic character. The size of atom increases down the group and ionization energy decreases. The metallic character is increased in this way and metals become more reactive.

Example:

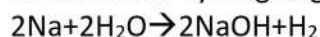
Cs (cesium) is the most reactive metal of periodic table.

Q 24. Ionization of alkanline earth metals is higher than alkali metals?

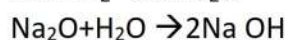
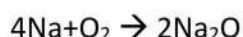
Alkaline earth metals have small size and less nuclear charge than alkali metals. As a result alkaline earth metals have high ionization energy than alkali metals.

Q 25. Write any two chemical properties of alkali metals? OR Write chemical properties of alkali metals. How alkali metals react with water? Explain with one example. OR Write chemical reaction of sodium with oxygen. OR Write any two chemical properties of alkali metals?

Reaction with Water: They react with water vigorously at room temperature to give strong alkaline solution and hydrogen gas

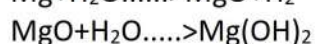
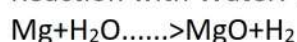
$2Na+2H_2O \rightarrow 2NaOH+H_2$

Reaction with O_2: They immediately tarnish in air giving their oxides which fro m strong alkalies in water

$4Na+O_2 \rightarrow 2Na_2O$

$Na_2O+H_2O \rightarrow 2Na\ OH$

Q 26. Write chemical properties of alkaline earth metals? OR Which product is formed when magnesium react with water?

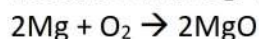
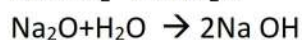
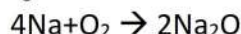
Reaction with Water: They react with water less vigorously and on heating they produce weak bases

$Mg+H_2O$......>$MgO+H_2$

$MgO+H_2O$.....>$Mg(OH)_2$

Reaction with O_2: They are less reactive towards oxygen and oxides are formed on heating
$2Mg + O_2 \rightarrow 2MgO$

Q 27. Write chemical reaction of sodium with oxygen.

$4Na + O_2 \rightarrow 2Na_2O$

$Na_2O + H_2O \rightarrow 2NaOH$

Q 28. Why copper is used for making electrical wires?

Copper is used to make electrical wires because of the following reasons:
Copper has high ionization potential than other transition metals. (it ionizes more)
Copper has high thermal coefficient
Copper is strong, ductile as well as malleable.

Q 29. Write two uses of sodium.

Sodium-potassium alloy is used as a coolant in nuclear reactor.
It is used to produce yellow light in sodium vapour lamps.

Q 30. Write two uses of silver.

Silver is used in mirror industry
Silver is used in photographic films and dental preparations.

Q 31. Give two uses of calcium? OR Write two properties of calcium?

it is used to remove sulphur from petroleum products.
It is used as reducing agent to produced Cr, U and Zr.

Q 32. What is the color of flame when sodium and calcium burn in air?

The colour of sodium is pure yellow and calcium flame is brick-red colored.

Q 33. Give two uses of magnesium

Magnesium is used in flash light bulbs and in fireworks.
It is used in the manufacture of light alloys.

Q 34. Write down two properties of gold.

i. Gold is least reactive metal.
ii. It is most malleable metal.

Q 35. Can Pure gold be used for making ornaments? If not Why?

Pure gold cannot be used for making ornaments because gold is too soft to be used as such. Gold is always alloyed with copper, silver or some other metal.

Q 36. Why platinum is used for making jewelry?

Platinum is used to make jewelry items because of its unique characteristics like color, beauty, strength, flexibility and resistance to tarnish. it provides a secure setting for diamonds and other gemstones enhancing their brilliance.

Q 37. Why Silver is rarely used in pure state?

Silver is not used directly for practical purposes because:

- It is relatively soft, very malleable and can easily be damaged.
- It is expensive, high labor rates and expensive methods are required for its extraction.

Q 38. Write two uses of gold?

Gold alloys are used in ornaments
Gold was used in making coins.

Q 39. What do you mean by 24 carat Gold? OR What is the unit of purity of gold.

The purity of gold is expressed by its carat number. It tells us how many parts of gold are used in 24 parts of alloy. 24 carat means 22 parts of gold are alloyed with 2 parts of other metals.

Q 40. What do you mean by malleability?

The property of metal with which its shape can be deformed by applying external force or stress is called malleability of metal.
Soft metals can easily be deformed so they are highly malleable

Example: Sodium is malleable but gold is the most malleable metal of periodic table.

Q 41. Write uses of platinum?

platinum is used to make jewelry items
Platinum is used in the production of hard disk drive coatings and fiber optic cables
Platinum is used in manufacturing of fiber glass reinforced plastic and glass for liquid crystal displays(LCD)

Q 42. How is platinum used as catalyst in automobile? Give its advantages.

An alloy of platinum, palladium and rhodium is used as catalyst in automobiles as **catalytic convertor.**
Function:
It converts most of the toxic gases (CO, NO_2) being emitted by vehicles into less harmful carbon dioxide, nitrogen and water vapors.

Q 43. What are transition metals?

The elements in which d-orbital are in the process of filling, constitute a group of metals called transition metals or d-group elements. They exhibit a variety of oxidation sates.

Q 44. Which factors affect the non-metallic character?

The non-metallic character depends upon the following factors:
Electron affinity
Electronegativity
Furthermore, small sized atoms have large effective nuclear charge and hence large electronegativity and electron affinity. So, they have high non-metallic character.

Q 45. Give chemical properties of non metals?

- Non metals usually do not react with water.
- They form ionic compounds with metals and covalent compounds with other non metals e.g. CO_2, NO_2 etc.

Furthermore, small sized atoms have large effective nuclear charge and hence large electronegativity and electron affinity. So, they have high non-metallic character.

Q 46. Give the non metallic trend of halogens?

Non-metallic character decreases downward in a group. Trend of non-metallic character:
F>Cl>Br>I

Q 47. Write down the symbols of noble gases?

Nobel gases are Helium (He), Neon (Ne), Argon (Ag), krypton (kr) and Xenon (Xe)

Q 48. Write down names of any four halogens. OR Write a symbol of any four elements of halogen group.

Most common Halogens are

- Fluorine (F)
- Chlorine (Cl)
- Iodine (I)
- Bromine (Br)

Q 49. What is the color of iodine and bromine?

Colors of iodine is Purple Black and that of bromine is Redish Brown

Q 50. What are halogens? Write the color of two of them? OR What are halogens? Which halogens exist in gas?

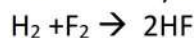
The elements of group-17 of the periodic table consist of Florine (F), Chlorine (Cl), Iodine (I), Bromine (Br) and they are collectively known as halogens.
Colors of iodine are Purple Black and that of bromine is Redish Brown.

Q 51. Write any two chemical properties of halogens?

1. All the halogens are oxidizing agents.

$$2KF + Br_2 \rightarrow 2KBr + I_2$$

2. All halogens react with hydrogen to hydrogen halides.

$$H_2 + F_2 \rightarrow 2HF$$

Q 52. How chlorine chemically react with dilute NaOH.

Chlorine reacts with dilute NaOH to give sodium hypochlorite and sodium chloride. The reaction is as follows:

$2NaOH + Cl_2 \rightarrow NaCl + NaOCl + H_2O$

Q 53. Why nitrogen is useful for human? Or Why Nitrogen is necessary for safety of life on earth?

Nitrogen constitutes 78% of atmosphere, is necessary for **Safety of life on earth.** It controls fire and combustion processes, otherwise all things around us could burn with a single flame.

Q 54. Give uses of nonmetals?

Non-metals are widely utilized in wooden or plastic furniture, plastic sheets and bags, plastic pipes utensils are made of non-metallic elements. Even all the pesticides, insecticides fungicides and germicides consist of non-metals as major constituents.

Q 55. Why is HF a weak acid?

In HF molecule the difference of electronegativity is 1.7 which results in formation of strong highly polar covalent bond. The strong intermolecular forces develops between the molecules of HF. Due to these attractive forces, HF cannot be ionized which makes HF weak acid.